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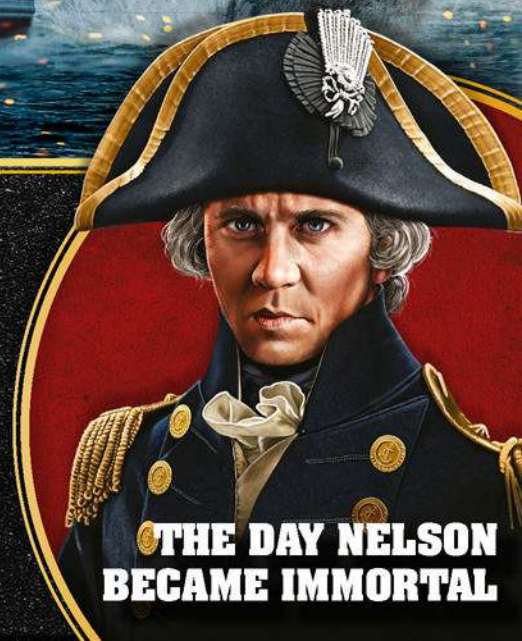
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「 FUTURE 」

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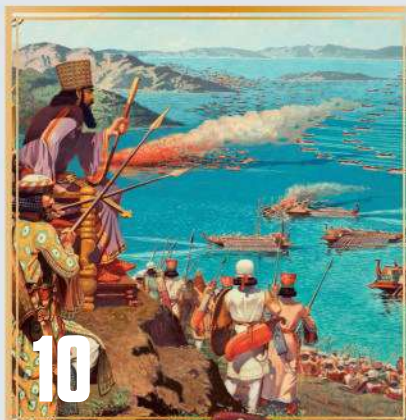


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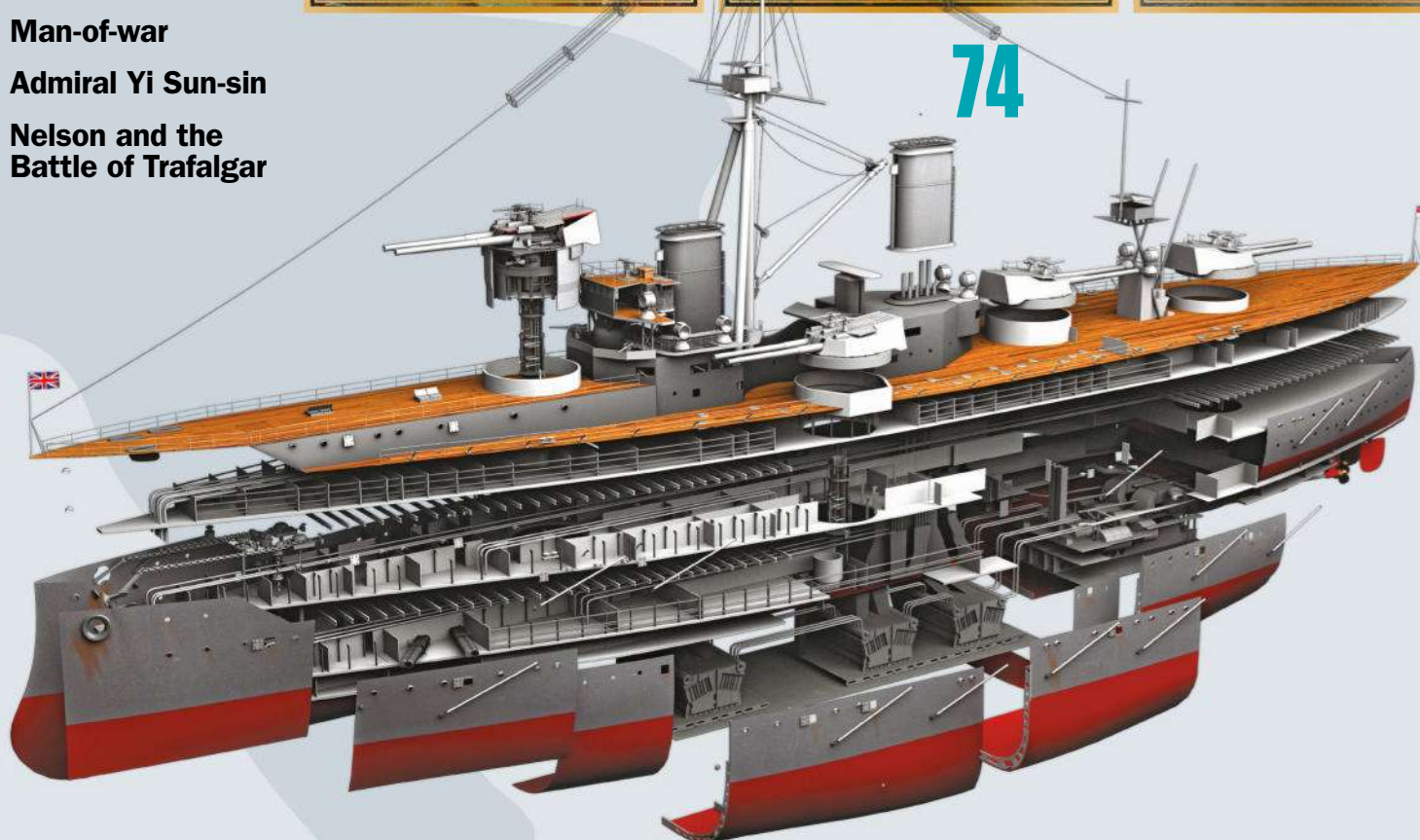
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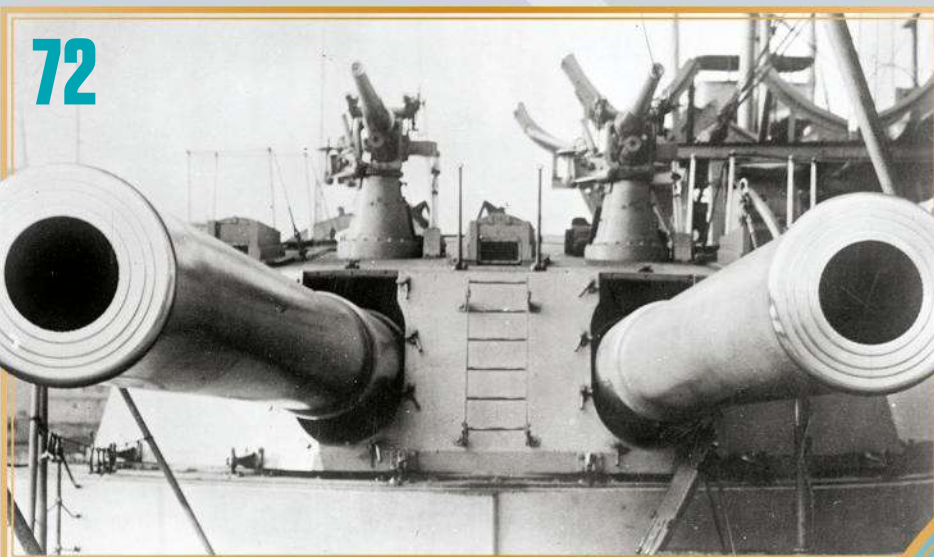
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OAR AND PEACE

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With their freedom and fledgling democracy at stake, the Greek city-states had no choice but to unite against the threat of Persia

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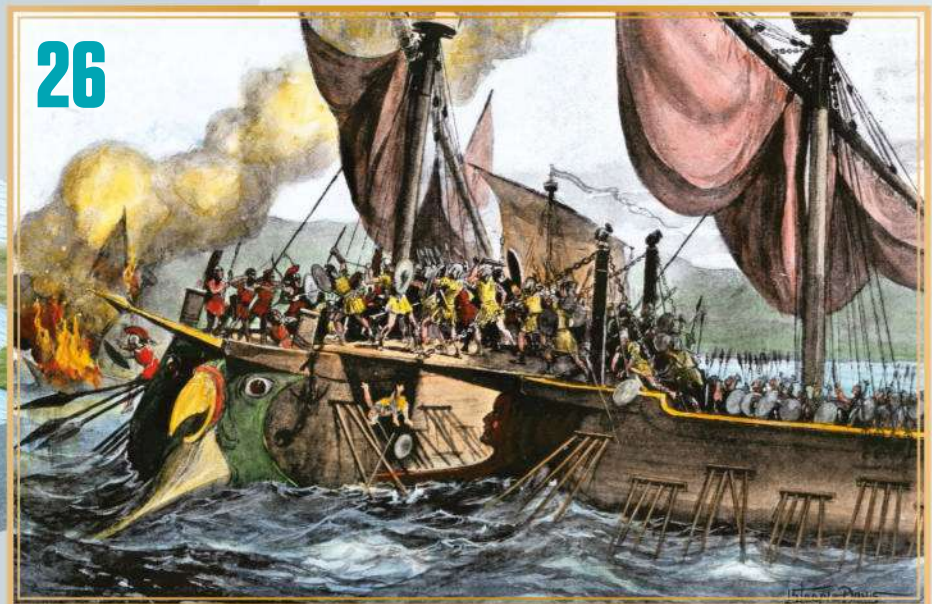
In her struggle against Carthage, Rome was forced to copy the enemy to secure victory

26 Battle of Ecnomus

After eight years of bloody war the fleets of Rome and Carthage clashed in the waters off the island of Sicily

30 Battle of Actium

Nothing less than the fate of the Roman Republic was on the line when Octavian's ships lined up against Marc Antony and Cleopatra off the coast of Greece. Victory would make one man immortal





Great Battles

SALAMIS

DESPITE BEING VASTLY OUTNUMBERED, THE GREEKS
MANAGED TO DEFEAT THEIR PERSIAN ENEMIES AT SEA

WORDS MURRAY DAHM



In the summer of 480 BCE, the Persian King Xerxes I invaded mainland Greece with a massive army rumoured to number 5 million men aboard 1,200 warships. No one today believes those numbers, but the invasion was the largest Greece had ever seen. Ostensibly, it was to punish two Greek cities, Athens and Eretria, for their part in a revolt of Persian vassal states in Ionia 15 years earlier. The resources brought to bear, however, reveal that the conquest of Greece was Xerxes' real intention, adding it to his western provinces. This quest would reach its climax at the Battle of Salamis.

As the Persians advanced across the Hellespont and down through Greece, they reached the pass of Thermopylae by land and Artemisium by sea. There, the Greeks planned to delay the Persian advance. Up to that point the Greek states (such as Macedon) had had little choice but to succumb to Persian dominance and join with their new master or be destroyed. The states that collaborated with Persia were known as 'medisers' (the

Medes being synonymous with the Persians since both came from the same homeland). An earlier plan to meet and delay the Persian advance further north, at Tempe, had to be abandoned, which reveals the major problem faced by the Greeks – unity.

An alliance of city-states

Greece at this time was a very loose collection of city-states governed in different ways and with different languages and interests. The cities spent most of their time warring with each other over land and religious disputes. The two largest city-states, Athens and Sparta, were atypical of the majority of other cities: most were smaller and looked to Sparta and Athens (in that order) for leadership. Sparta, centred in the Peloponnese, had a unique dual-monarchy system of government and was primarily concerned with maintaining a military system to control its lands. These were run via a system of state slavery called helotry, which allowed the Spartan citizens (Spartiates) to concentrate on military training.

This 1868 painting shows moments of the battle: Xerxes jumping from his throne and Artemisia firing arrows into the Greeks

OPPOSING FORCES

THE GREEK CITY-STATES

LEADER

Themistocles

TRIREMES

378

VS

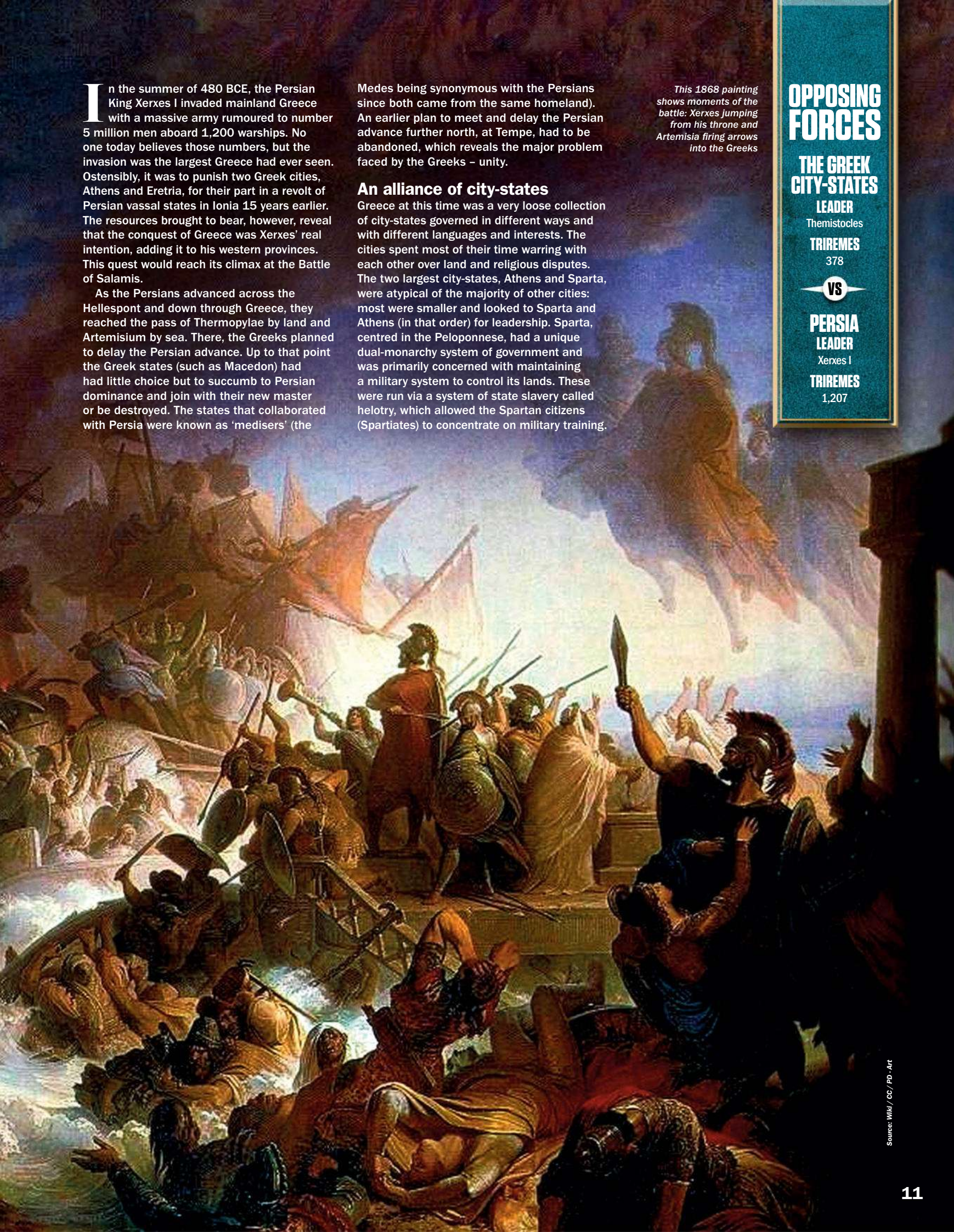
PERSIA

LEADER

Xerxes I

TRIREMES

1,207





Xerxes became king after his father, Darius I, died in 486 BCE



The death of Xerxes' brother Ariabignes during the battle



Themistocles, an Athenian statesman with long-term vision and powers of persuasion

Sparta was therefore the natural military leader of Greece. Unfortunately, their concerns were mostly localised (helots outnumbered Spartans by up to 20 to one), and it took a great deal of persuasion to get the Spartans to venture out of the Peloponnese. Athens, by contrast, controlled a large land base in Attica and had a fledgling political system, democracy, which was barely 30 years old. Athens was a hotbed of capitalism and new ideas in drama and philosophy. She was confident and put herself forward as Sparta's equal. Athens had defeated the first attempt to punish its involvement in the Ionian Revolt ten years earlier at the Battle of Marathon, where Athens almost single-handedly defeated a (much smaller) Persian army. Athens probably knew that other attempts would follow and developed a navy of triremes in the 480s BCE. The man most responsible for this was the populist Athenian statesman Themistocles, and he would have a major part to play at Salamis.

Thermopylae was never intended to be a decisive stand, even though the defeat of the 300 Spartans (all the city sent) has gone down in history as such. There were also 700

Thespians and 400 Thebans present but their sacrifice has been all but ignored.

The other cities' soldiers had already withdrawn, and fierce debate ensued to keep the alliance together. The

Spartans, along with the other states of the Peloponnese, were in favour of withdrawing to their peninsula, building a wall across the Isthmus of Corinth and defending their homeland. At the same

time as Thermopylae, the combined navy of Greek triremes had gathered at Artemisium. The Greeks had 271 triremes according to the historian Herodotus (our best source for the Persian Wars). This fleet

“ATHENS WAS A HOTBED OF CAPITALISM AND NEW IDEAS IN DRAMA AND PHILOSOPHY. SHE WAS CONFIDENT AND PUT HERSELF FORWARD AS SPARTA'S EQUAL”

was dominated by the 127 ships from Athens. Facing them were perhaps 800 Persian ships. The Greeks were massively outnumbered, but they had advantages. The Persians had already lost one-third of their fleet due to storms and not knowing the weather patterns of the western Aegean Sea. At Artemisium the Persians despatched 200 ships to round the island of Euboea and cut off the Greek retreat, but these too were lost.

Once the position at Thermopylae had been overrun, the Greek navy withdrew from Artemisium. Due to the majority of the fleet being from Athens, the Athenians requested that they now assemble in the straits of Salamis, an island off the coast of Attica, near Athens. The fleet, as well as ships from other states, came to Salamis. Some cities contributed a single trireme, but this was still a major resource. Athens contributed 180 triremes; the next closest (Corinth) contributed 40, showing the power and wealth of Athens. Unity was the major concern. One way of ensuring it can be seen in Athens allowing the Spartan admiral Eurybiades to take overall command, even though Sparta only contributed 16 ships. The Persians were close on the heels (or keels) of the Greeks and Themistocles knew that he would not need to hold the fleet together for very long before a decisive engagement could be fought. The position of Salamis and the tactics of the battle should be attributed to Themistocles' genius.

Help from the gods

One aspect of Greek life was that the gods needed to be consulted before almost every action. The most important oracle for consulting the will of the gods was located at the Temple of Apollo in Delphi; Greek cities constantly sought advice from the oracle (usually interpreted as obscure poems with often ambiguous meanings). The oracle at Delphi had advised the Athenians that “the wooden wall only shall not fall”. Many at Athens thought this meant the wooden wall that surrounded the Acropolis, but Themistocles interpreted the oracle differently to mean that the hulls of Athens' fleet were the wooden walls in which she should trust. What is more, Themistocles was able to persuade the majority of Athenians to follow him. Athens was now evacuated (to Troezen and the islands of Aegina and Salamis), and the Greeks prepared to defend the position in the straits of Salamis (a location also enigmatically suggested by the oracle). Herodotus' account is brought into question by the Decree of Themistocles, an inscription discovered in 1960 in Troezen, which suggests that the plan to evacuate Athens and to defend Artemisium then Salamis was in place well before the invasion even happened.

Athens burns

Those at Athens who believed that the wooden wall surrounding the Acropolis would be their salvation soon learned their mistake. The Persian army advanced on the city and burned it to the ground. The giant snake that the priests of Athens said would rise and defend them failed to make an appearance. The Athenian population on Salamis and Aegina could only watch as the smoke from their burning homes rose into the sky. This must have steeled the resolve of many in the Greek fleet, but others wanted to flee – unity was still a problem. Herodotus tells us that the decision was made to withdraw from Salamis and defend the Isthmus of Corinth. Themistocles argued



THE BATTLE OF SALAMIS

*Xerxes watches the
Battle of Salamis from
Mount Aegaleos*



passionately against such a decision and was able to convince Eurybiades to fight at Salamis.

The Persian fleet massively outnumbered that of the Greek city-states despite her losses in storms and at Artemisium. She had started with 1,207 triremes (Herodotus mentions, but does not count, smaller craft such as pentekonters – ‘50-oared’ ships). Despite the losses on the journey to Salamis, Herodotus tells us that these were replaced with reinforcements. The number of 1,207 seems unbelievable to us (240,000 rowers alone) but the resources available to Xerxes were unimaginable, for his empire stretched from India to Turkey and Egypt to Armenia. Nonetheless, modern reconstructions put Xerxes’ fleet at between 400 and 900 ships. The exact number of men per craft probably differed, but we have good statistics for Athenian triremes, with 14 hoplites and four archers per ship. We’ve used these numbers to extrapolate the crews of both sides but we know that one ship from Samothrace, for instance, was manned with javelinmen rather than archers. If the numbers are even remotely accurate the Persians had a massive fleet. However, its sheer scale also caused problems, namely that the fleet required a vast space in which to operate properly. On top of this, the Persian crews and their captains were operating in unfamiliar waters many leagues from home.

A slaughter at Salamis

To add to the obstacles facing the invaders, the geography around Salamis offered the smaller Greek fleet an advantage as it funnelled ships into a narrow stretch of water. Therefore, if the Greeks could draw the Persians in, their superior numbers would be nullified. What is more, the Persians might foul one another’s oars in their attempts to manoeuvre. At the same time, however, if the Persians despatched a fleet to the far side of the island, they could trap the Greek fleet. An alternative story is that Themistocles actually told the enemy that they could trap the Greek fleet in place, sending a slave to the Persians. In this way he ensured that the Greeks were trapped and therefore had to fight (the outcome he wanted).

At dawn the Greek fleet took up position in the straits of Salamis. Herodotus tells us

Chaos unfolds as the enemy fleets engage

01 XERXES INVADES

Xerxes invades Greece at the head of a massive army and navy. He crosses the Hellespont in April 480 BCE and makes his way towards mainland Greece, reaching Thermopylae in early September. There the Greeks try to delay him, at Thermopylae by land and Artemisium by sea.

02 THE ADVANCE CONTINUES

With the defeat at Thermopylae, the Greeks withdraw from Artemisium. The Persian fleet has suffered losses in storms (of perhaps as many as 600 ships). These are replaced by reinforcements.

03 LAST STAND AT SALAMIS

The Greek fleet withdraws to Salamis, off the coast of Attica. There they are joined by other Greek ships. Fierce debate on whether to defend Salamis or withdraw further and defend the Isthmus of Corinth ensues. The Persians, having detoured to Thermopylae to see the visible signs of the defeat of the Greeks there, move on to Athens by both land and sea. Athens’ population is largely evacuated.

SEPTEMBER 480 BCE

HOW THE HEAVILY OUTNUMBERED GREEKS DEFEATED THEIR PERSIAN ENEMIES AT SEA

04 ATHENS BURNS

Taking control of Athens, Xerxes defeats those few who took up position on the Acropolis. He burns the city. He now turns his attention to defeating the Greek fleet.

05 NO WAY OUT

With debate continuing among the Greeks as to the best course of action, Themistocles persuades Eurybiades to make a stand at Salamis. To ensure this happens, Themistocles sends word to the Persians that they should block the escape of the Greek fleet at the northern end of Salamis. The Persians despatch a squadron and the Greeks are told that there is no way out. They must fight it out here.

06 THE DAWN OF BATTLE

The Greek fleet takes up positions at dawn. The Persian fleet does likewise. The Athenian ships are on the Greek left, the Spartan-led ships on the right. Facing them, the Phoenician contingent of the Persian fleet opposes the Athenian ships, while those of the Ionians oppose the Spartan squadron.





10 THE ROUT IS COMPLETE

Seeing his fleet destroyed before him, Xerxes is enraged, executing those captains who are able to make their way to him to make their excuses. The Persian fleet is in tatters and tries to flee to Phalerum. Most ships are caught by fresh vessels from Aegina. Some Persian ships ram their comrades in a bid to convince the Greeks that they've changed sides.

09 STICKING TO THE PLAN

The Greek fleet, acting to a preordained plan, perform in concert and begin turning the Persian fleet. Parts of the Persian fleet attempt to flee only to become entangled with their own vessels behind. This makes them easy prey for their pursuers. Greeks who fall in the water swim to the island of Salamis. Members of the Persian fleet, the majority of whom cannot swim, drown or are killed in the water.

07 IT'S A TRAP!

The Greek fleet rows out and the Persian fleet immediately looks to engage them. The Greek fleet then begins to back water, luring the greater numbers of the Persian ships further into the narrower waters of the straits. There, the massive Persian fleet will be unable to manoeuvre.

08 LET THE RAMMING BEGIN

An Athenian ship (or one from Aegina) is the first to ram an enemy vessel. Other ships from both sides now move to ram one another. The archers and javelinmen on the decks of the triremes rain down missiles on enemy ships. Once a ship is rammed, the hoplite marines from one vessel board the rammed ship and a battle ensues between the infantrymen of each vessel.

that the Persian fleet immediately set upon them. Perhaps the Persians were already in position to attack the (surrounded) Greeks. The Greek ships checked their advance and began backing water. This was most probably a deliberate tactic to lure the Persians further into the narrower waters of the straits. One of the Athenian ships, commanded by Ameinias of Pallene (one of the ten demes, or districts, of Attica), then rammed a Persian ship and the battle proper began.

Herodotus' account is confused and he highlights different moments of the action (as well as recording various viewpoints). Modern commentators have preferred to break down the battle into clear phases where squadrons of each fleet made decisions and acted en bloc. Some of Herodotus's details suggest that confusion may be a better way of thinking about how the battle unfolded, even though it makes it difficult to see a clear picture.

Men from the island of Aegina claimed that they were the first to ram the enemy. Modern reconstructions see three squadrons – Athenian, allied and Spartan-led – but the details must be taken from Herodotus. He tells us the Athenians faced the Phoenicians stationed on the Persian left wing, closest to Eleusis. The Spartans (probably with ships from the remainder of the Peloponnese, so from states such as Corinth and Epidaurus) faced the Ionian ships on the Persian right wing (closest to Piraeus). These details are confusing – Eleusis is north of Salamis and so would be the Persian right wing; Piraeus to the south would make it the Persian left. Perhaps Herodotus was describing the positions from the Greek perspective (so on the Greek left the Athenians faced the Phoenicians and on the Greek right they faced the Ionians).

Another advantage the Greek fleet had over the Persians was a coherent plan. It's

possible that a lone ship rammed the enemy when all the others were backing water according to a preordained plan, but the Greeks on the whole acted in concert. On the Persian side, each contingent seems to have acted alone. Ionian ships may have held back since Themistocles had sent word to them encouraging them to defect. And so each Persian contingent, singly, was no match for the Greek ships in familiar waters and where their smaller numbers were turned into an advantage. Persian commanders may also have acted rashly to try and gain the approval of their king.

Eyes of the king

Xerxes himself was not aboard any ship but instead had a throne set up on the mainland and was sitting with a view of the battle, perhaps on Mount Heraklion or Mount Aegaleos. His commanders in the fleet below



were determined to fight more bravely under his eye (and thereby earn his praise and perhaps reward or promotion). Herodotus names two men who gained promotion in this way, Theomestor and Phylacus, but the most famous was Artemisia, the female commander from Halicarnassus. She commanded five ships but, to avoid an Athenian ship chasing her during the battle, rammed another Persian ship. The pursuit stopped (assuming they were in fact Greek or had changed sides) but Xerxes, seeing her action, commented that “my men have turned into women, my women into men”. This anecdote is further complicated by the fact the Athenians had offered a reward for the capture of Artemisia – a female commander was something they could apparently not tolerate.

Many Persians and Persian ships were lost – Herodotus tells us that many in the Persian

fleet could not swim, unlike the Greeks, who swam to the island of Salamis. The greatest losses occurred when the first Persian ships to engage tried to turn about and retreat. They became fouled in the ships behind them, rendering both sets of vessels useless. Xerxes was apoplectic with rage as he saw his fleet destroyed before his eyes. He is said to have beheaded captains on the spot who came to him to try and explain why the battle had not gone as expected. The remnants of the Persian fleet made its way to Phalerum, chased by Aeginetan ships, but they were too few in number and Xerxes’ invasion was sunk. Without a fleet he could not provision his army properly and his road home to Persia was threatened by the victorious Greek fleet. He soon fled back to Persia, leaving an army under Mardonius to be defeated at Plataea the following year.

The Greeks celebrate their victory over the Persians at Salamis, 480 BCE

“HE IS SAID TO HAVE BEHEADED CAPTAINS ON THE SPOT WHO CAME TO HIM TO TRY AND EXPLAIN WHY THE BATTLE HAD NOT GONE AS EXPECTED”



THE OARSMEN

Rowers consisted not of slaves but of free men and hired foreigners. The oarsmen were divided into three groups. The thranitai occupied the top section of the ship – a position that was relatively comfortable in comparison with conditions below. However, added strength and agility were required of these men. The middle section, who were known as the zygitali, rowed directly beneath the thranitai although at a slightly different angle, while the lowest set of rowers, the thalamitai, were seated in dismal surroundings at the bottom of the ship. The heat here was intense. The oarsmen were particularly vulnerable during enemy engagement, and if the rowers were captured the enemy would dismember their thumbs or cut off their hands. Moreover, if they were trapped below deck during a hostile encounter they risked drowning.



© Deror Avi, 2010

LARGE MAST

The mast was used for propulsion, but it was lowered during periods of hostile engagement.

HELMSMAN POSITION

The helmsman was placed at the stern so that he was able to guide and command the ship.

THE AKROSTOLIO

To complement the bow, the stern was designed with a tail so that the ship resembled a mythological sea monster.

CAPTAIN'S SEAT

The seat was designed at the rear of the ship for the benefit of the commanding officer.

ARCHERS AND SPEARMEN

Marines were placed along each side of the vessel to protect the ship during battle.

ROWERS

Rowers were placed at three levels on the ship. At the top sat 62 thranitai, in the middle 54 zygitali, and at the lowest level were 54 thalamitai.

INSIDE A TRIREME

The trireme was a long, narrow vessel highly unsuited for habitation. As a military ship, it was not designed for long journeys and there was no room for large stores of food or water. The ship was designed so the height of the hull rose only two metres above the water level, its draught was shallow and its keel was flat, allowing the crew to carry the ship to shore each night.

STORAGE

There wasn't much room to store large amounts of food or water and therefore long journeys were kept to a minimum.

© Alex Pang

GREEK WARSHIPS

TRIEMES – THE ULTIMATE FIGHTING MACHINES

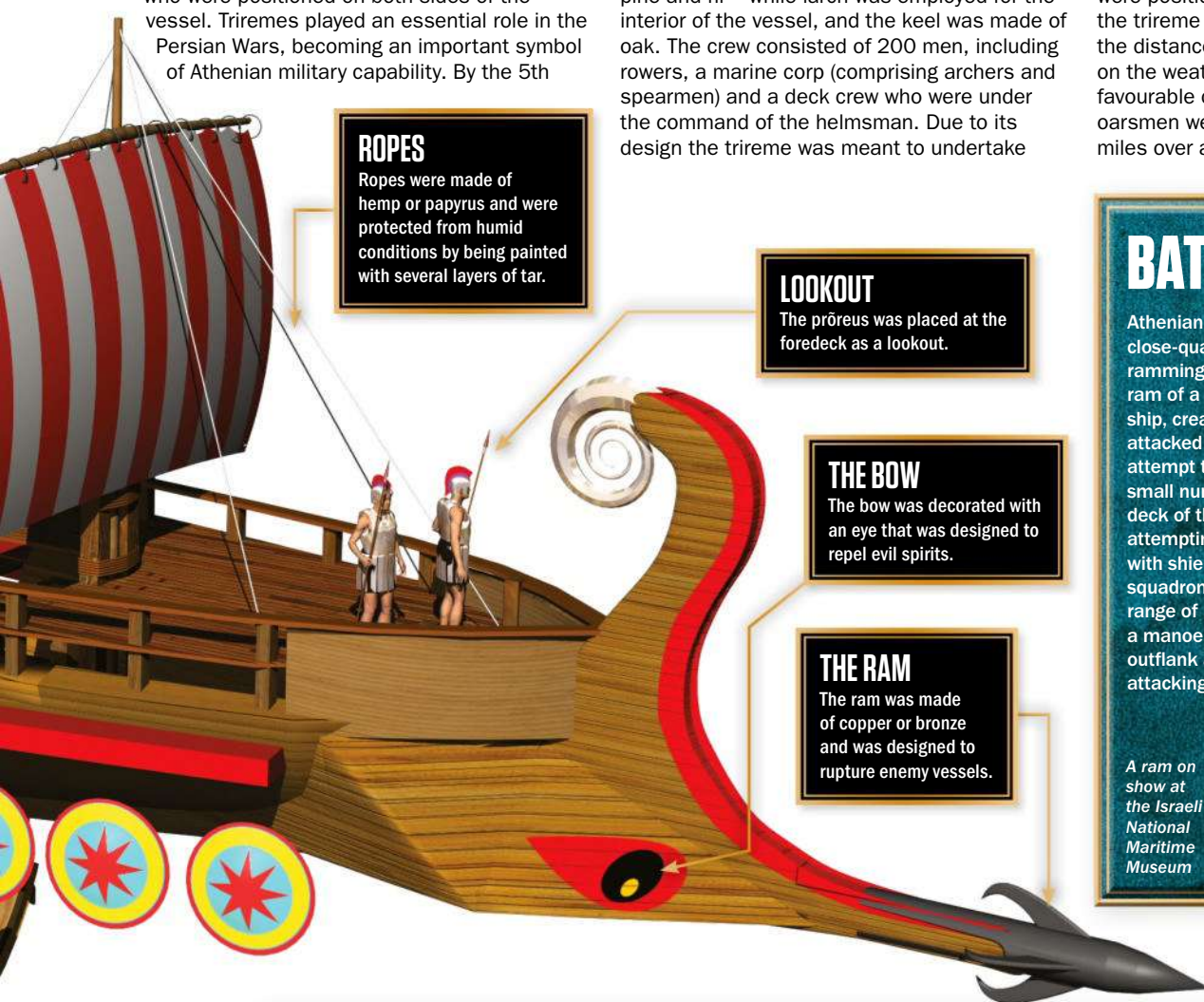
First used in the 8th century BCE, the trireme was a state-of-the-art military machine. Fast and agile, triremes were designed to exert maximum power during military engagements. Both the Greeks and the Phoenicians employed these ships for military and trading purposes – its name is derived from its ability to seat three levels of rowers, who were positioned on both sides of the vessel. Triremes played an essential role in the Persian Wars, becoming an important symbol of Athenian military capability. By the 5th

century BCE these ships came to dominate the waters around the eastern Mediterranean.

Construction of a trireme began with the hull. Later, the builders added wooden ribs in order to strengthen the vessel. These were reinforced with ropes that were fitted to the keel and stretched tightly over the timber. The ships were built with soft woods – namely pine and fir – while larch was employed for the interior of the vessel, and the keel was made of oak. The crew consisted of 200 men, including rowers, a marine corp (comprising archers and spearmen) and a deck crew who were under the command of the helmsman. Due to its design the trireme was meant to undertake

short, swift operations. At night the ships would pull into harbour, where the crew would collect fresh water and store it for the next stage of the journey.

Primary propulsion came from the oarsmen, with one man per oar. While the ship was designed with two masts, its steering was actually controlled by two large paddles that were positioned at the stern. It is believed that the trireme could sail at six to eight knots; the distance it travelled depended entirely on the weather and its overall manpower. In favourable conditions it was thought that the oarsmen were able to propel the ship 50 or 60 miles over a seven-hour period.



ROPES

Ropes were made of hemp or papyrus and were protected from humid conditions by being painted with several layers of tar.

LOOKOUT

The prôreus was placed at the foredeck as a lookout.

THE BOW

The bow was decorated with an eye that was designed to repel evil spirits.

THE RAM

The ram was made of copper or bronze and was designed to rupture enemy vessels.

BATTLE TACTICS

Athenian military operations depended on close-quarters battle tactics, namely the ramming and boarding of enemy ships. The ram of a trireme was built at the front of the ship, creating a large metal horn. When the ship attacked it would come in from the stern and attempt to rupture the hull of the enemy ship. A small number of marines were placed on the deck of the ship. They would defend or attack, attempting to board the enemy vessel armed with shields, spears and archery equipment. A squadron of triremes employed a wide range of battle tactics. These included a manoeuvre that was designed to outflank and encircle the enemy before attacking the rear of their ship.

A ram on show at the Israeli National Maritime Museum

© Hanay, 2010

WHY WERE SHIPS GIVEN FEMALE NAMES?

There are many theories and no clear answers. Triremes, with only rare exceptions, were named after female deities or mythological figures. The Greeks named their ships after sea nymphs like Thetis or Charis

or after women of legendary courage, such as Danae or Prokne. In ancient times the ship would also sail under a female figurehead that would guide or protect the vessel – before leaving port prayers and sacrifices

were made to a goddess who was thought to safeguard the journey. The all-male crew may have associated their ship with the female shape and form – the boat, being a vessel of men, had clear female principles.



*Capsized crewmen call
for help from their allies*

TO MAKE WAR ON THE WAVES

THE EARLIEST NAVIES AROSE TO
PROJECT POWER OVER WATER, PROTECT
THEIR HOMELANDS FROM SEABORNE
ATTACK AND SUPPRESS PIRACY

WORDS MARC DESANTIS

Ancient states needed to mount attacks across water, defend their coastlines from attack and fight pirates. The growth of maritime commerce further encouraged the expansion of naval forces to protect these lucrative trading links.

Warship construction was an expensive, resource-intensive undertaking, requiring huge quantities of suitable timber and numerous skilled craftsmen to assemble the vessels. The most common type of warship in the ancient world, particularly on the Mediterranean Sea, was the war galley. This was a sleek sailing craft ordinarily propelled by a large complement of oarsmen when in battle. It was arguably the most advanced piece of technology produced in ancient times.

Because war galleys carried large crews relative to their size, they couldn't transport much in the way of food, drinking water or other supplies. Their range was thereby very limited. If they were deprived of their land bases, ancient fleets would wither and die very quickly.

The usual tactics employed by war galleys were ramming and boarding. When ramming, a war galley would impact its bow into the hull of an enemy vessel, seeking to hole and cripple it. During boarding, the galley would come alongside an opponent's ship and send its embarked soldiers – its 'marines' – over to the other vessel to fight for its possession.

The navies of Egypt, Persia, Carthage and Rome all featured strongly in the histories of those powerful empires. Though the circumstances that compelled these states to develop their navies may have differed in detail, at root they came about because it was necessary for them to fight on the waves.





ANCIENT EGYPT

Building warships presented the ancient Egyptians with serious problems because of a lack of appropriate native wood. Timber, such as cedar and cypress, had to be brought in from other lands as far back as the Old Kingdom. Later, during the New Kingdom, the need to protect timber imports impelled the great warrior-pharaoh Thutmose III to fight in Phoenicia, a region that produced high-quality shipbuilding wood. Sterling sources for the appearance of ancient Egyptian fighting

ships are the Medinet Habu reliefs, depicting the navy of Ramesses III combating the 'Sea Peoples' in the Battle of the Delta in 1175 BCE.

In the early 12th century BCE, a mass migration of northerners, known collectively by the Egyptians as the 'Sea Peoples', overran many parts of the eastern Mediterranean region and were intent on invading Egypt. The fertile Nile Delta was an inviting place for them to settle. Ramesses III readied his kingdom for war. The pharaoh recorded that he 'caused the

river mouth to be prepared like a strong wall with warships, transports and merchantmen; they were manned entirely from bow to stern with brave fighting men and their weapons'.

The typical Egyptian warship sprouted a single mast and was steered via a large, stern-mounted oar. Propulsion was provided by a sail as well as oarsmen. During combat it's likely that the sail was furled, with the ship relying entirely on its rowers. Two fighting 'castles' for marines were positioned at the bow and stern. As they closed, the Egyptians launched many arrows at the Sea Peoples, and these took a heavy toll on the invaders.

When coming alongside, the Egyptians tossed grapples and sent marines over to capture enemy ships. On the Medinet Habu reliefs the Sea Peoples' ships are depicted as having capsized. Some may have been pulled over by the Egyptians using the grapples. Egyptian warships are also depicted as sporting lion-headed extensions at their prows. These may have been rams. If so, they might have been used to knock over the Sea Peoples' vessels. The Battle of the Delta was a great Egyptian victory. Ramesses III claimed that the invaders 'were dragged, overturned and laid low on the beach, slain and made heaps from the stern to bow of their galleys'.



CARTHAGE

The navy of the great North African city of Carthage was a formidable fighting force. Punic mariners – the Romans called the Carthaginians, originally from Phoenicia, 'Punics' – were skilled in manoeuvre warfare, in which a galley was guided through twists and turns into a position from whence it could ram an opponent's ship. Once accomplished, the galley would 'back water', removing itself from the stricken enemy craft, and go in search of another target.

A strong navy was important to Carthage because it needed to protect its extensive overseas mercantile empire. Apart from the mother city itself, Carthaginian cities and trading posts were scattered across North Africa, Sicily, Spain and Sardinia. Carthaginian shipbuilding techniques were oriented to high-volume production. The remains of a Carthaginian galley discovered near Marsala, Sicily, in 1971 display markings set in place on pre-cut timbers to hasten the construction of warships.

The mainstay war galley of the Carthaginian navy was the quinquereme, a bigger relative of the trireme. Surprisingly, despite the Carthaginians' long head start in matters nautical, they rarely fared well in combat with the relatively inexperienced-at-sea Romans when the two peoples fought in the First Punic War. The Romans won lopsided victories in early fleet

The Battle of Tunis, also known as the Battle of the Bagradas River, between the Roman Republic and Carthage occurred in the spring of 255 BCE



engagements at Mylae in 260 BCE and in the colossal Battle of Cape Ecnomus in 256 BCE. The key to Roman success was the corvus boarding bridge. This device allowed the Romans to make very effective use of their legionaries in boarding actions. The Carthaginians' tactical ship-handling skills mattered little once Roman marines had crossed over to their galleys.

The Carthaginians did win a notable naval victory at Drepana in 249 BCE. A poorly commanded Roman fleet had surprised the Carthaginians, still in port, at dawn. The

Carthaginian admiral, Adherbal, quickly roused his seamen, got them aboard their ships and out to sea. By the time the Roman ships had all reached Drepana the Carthaginians were ready for battle, managing to pin the Romans against the shoreline – the result was a crushing victory for the Carthaginians. Notwithstanding this success, the Romans won the First Punic War with a naval victory at the Aegates Islands in 241 BCE. In its two subsequent wars with Rome the Carthaginian navy would not figure heavily in the outcomes.

PERSIA

Ancient Persia relied heavily on subject peoples to furnish it with troops for its gigantic imperial army. Much the same held for the navy, with the Great Kings of the Achaemenid dynasty drawing upon several regions with strong maritime traditions for ships and crews. The 'Persian' navy was thus a multinational force.

The imperial Persian invasion fleet that sailed against Greece in 480 BCE was strongly representative of this diversity. Xerxes I, the Great King of Persia, sought to finish what his father Darius I had started back in 490 BCE, mounting a second assault on the Greek mainland. It's recorded that this fleet numbered precisely 1,207 warships.

The largest contingent, at 300 warships, was provided by the Phoenicians, who were reputed to be the best of mariners. Next came the 200 of the Egyptians. The Cypriots sent 150 warships, while hundreds more were provided by Cilicia, Lycia et Pamphylia, Caria and even by the Greeks of Asia, who were also subjects of the Persian monarch.

The workhorse warship of the Persian fleet, as well as that of its Greek opponent, was the trireme war galley. A trireme had three levels of oarsmen, one above or below the next, and had a full crew of about 200 men. The Persian ships

themselves carried some 30 marines, drawn mainly from among the Persians, Medes and the Sakas.

Phoenician-built triremes tended to be lighter than those of the Greeks, and their crews were more skilled at tactical manoeuvring to deliver a devastating ramming attack. An enemy ship would thereby be crippled. After the strike, it would either drift helplessly or perhaps be boarded by Persian marines.

The Persian fleet would fight a pair of dramatic battles in 480 BCE. The Battle of Artemisium was a tactical draw. There the Persians would earn a strong reputation for toughness because they succeeded in capturing no fewer than five Greek galleys.

At the subsequent Battle of Salamis, the Persian fleet threw away its advantages of numbers and skilled ship handling when it entered the narrow confines of the Salamis strait, where there was scant opportunity to manoeuvre. The result was an astonishing Greek victory.

Ironically, some of the hardest fighting seamen on the Persian side at Salamis were themselves Greeks. They came from Ionia on the western coast of Anatolia, which was part of the Persian Empire, further highlighting the multinational nature of the Persian navy.

"A TRIREME HAD THREE LEVELS OF OARSMEN, ONE ABOVE OR BELOW THE NEXT"

In 334 BCE, Alexander the Great, king of Macedonia, invaded the Persian Empire. Alexander soon demobilised his navy, thinking that it was too costly and also that he could defeat the Persian navy by capturing all of its coastal bases in the eastern Mediterranean.

The Persian navy, under Memnon of Rhodes, attempted to stir up trouble in Alexander's rear by seizing cities and islands in the Aegean Sea. Alexander became concerned enough that he reassembled some naval forces to counter the Persians. Whether this Persian naval strategy would have borne much fruit is unknown. Most Persian military efforts were soon redirected towards the building of a new army to fight the Macedonian invaders on land. Further, its chief commander Memnon died around this time, and nothing lasting came of the naval campaign. Eventually, Alexander captured the eastern Mediterranean seaboard. He thereby defeated the Persian navy from the land, as he had always intended.

ROME

Roman naval power was relatively limited prior to the First Punic War with Carthage. When Rome and Carthage came to blows over Sicily, the Romans found that while they were well-suited to a war on land, they couldn't contend with Carthage's mighty and talented navy at sea. The Romans might bring a coastal Sicilian city into submission, but its allegiance would often be lost upon the arrival of a Punic fleet offshore.

The Romans decided that they had to take the fight to the enemy at sea. In 260 BCE they copied a captured Carthaginian quinquereme war galley, churning out a large fleet in just 60 days. Having scant maritime experience, the Romans were tactically unskilled. Also, their ships were found to be slow and ungainly. The Punic would continue to have the edge in naval combat.

The Romans' solution was the *corvus* boarding bridge. The *corvus* was a long, spiked gangplank installed at the prows of Rome's quinqueremes. It could be turned in an arc and dropped on a nearby enemy vessel. Once embedded, the spiked *corvus* prevented the Carthaginian galley from getting away while Roman marines poured across. The Romans enjoyed huge success with the *corvus*, winning victories at the Battle of Mylae in 260 BCE and at Ecnomus in 256 BCE.

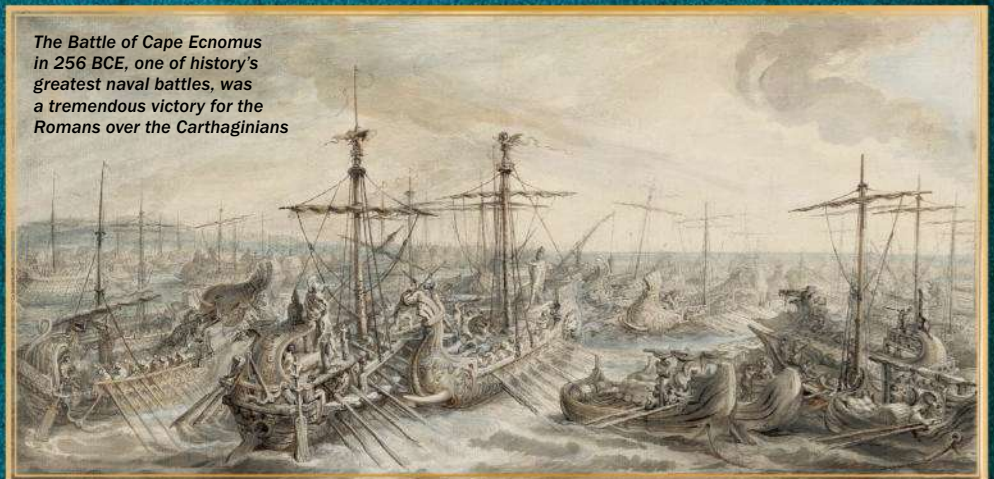
Nonetheless, the war would drag on until the Romans triumphed in one final naval battle at the Aegates Islands in 241 BCE. Despite the tactical advantage brought by the *corvus*, it mysteriously disappeared from the historical record after Ecnomus. It has been speculated that the *corvus* made Roman ships top-heavy and thus prone to capsizing in rough weather, leading to their removal.

During the imperial period, Rome found itself the master of the entire Mediterranean

seaboard. Major fleet battles would be rarities. Though large war galleys did not disappear altogether, the Romans shifted towards building smaller, faster ships that were better suited for patrol work against pirates. The workhorse of the fleets of the early empire was the light and swift craft known as the *liburna*.

During the late empire, from the *liburna* would evolve the *dromon*, also a fast ship of one or two oar banks. The *dromon* was the mainstay of Late Roman imperial fleets.

The Battle of Cape Ecnomus in 256 BCE, one of history's greatest naval battles, was a tremendous victory for the Romans over the Carthaginians



ROMAN WARSHIP

ROMAN REPUBLIC
3RD CENTURY BCE

The First Punic War was the first of three wars fought between the Roman Republic and the Carthaginian Empire. It broke out in 264 BCE when Carthage intervened in a dispute between the cities of Messina and Syracuse on the island of Sicily, a Carthaginian province. Rome got involved on behalf of Messina while Carthage supported Syracuse, triggering a bitter war for control over Sicily that lasted over 20 years.

While Carthage had a powerful navy that dominated the waves, it was the first time that Rome was required to build one. It was said by Polybius, a Greek historian, that the Romans did not know how to build warships and so they looked to a Carthaginian ship – a quinquereme – that had washed ashore. In just a few weeks, they built a fleet of 100 quinqueremes (as well as 20 triremes) based on this ship.

The Romans finally scored their first naval victory at the Battle of Mylae in 260 BCE, during which they managed to destroy or capture 44 Carthaginian ships.

Even though other vessels were used, the quinquereme became the main warship used by the Romans during the Punic Wars. These ships were evolved over time and Rome's eventually emerged victorious, with the Punic Wars culminating in the destruction of Carthage in 146 BCE.

The quinquereme helped the Romans gain supremacy over the Mediterranean and played a major role in their naval battles for centuries. However, these ships were ultimately superseded by smaller ones after the Battle of Actium in 31 BCE, a naval battle that took place at the end of the Roman Republic. We have chosen to look at an example of an early version of the quinquereme, although it is worth noting that particular details of the ship still remain unclear.

THE CORVUS

Roman quinqueremes were vulnerable to the ramming ability and speed of the Carthaginian ships, especially as their crews were less experienced. To solve this, the Romans created the corvus, a bridge with an iron spike that could be lowered and locked onto an enemy ship, allowing their infantry to cross over and attack. Although successful, the weight of the corvus made the ships unstable and so they were eventually abandoned.

ARMED FORCES

The size of the ship enabled it to carry a large naval infantry force, with between 40 to 120 marines onboard at one time. As the quinquereme was developed, artillery weapons such as catapults and ballistae became later additions to the ship, as well as archery towers.

EMBELLISHING THE SHIP

As the quinqueremes became more developed the Romans added more decorative elements. The prow of the ships could be in the shape of a sacred animal or a god, and the sternposts and stemposts decorated with figureheads.

APOTROPAIC EYE

Painted on the prow of quinquereme ships was an apotropaic eye, a divine element that was believed to protect against envy, misfortune and evil spirits. The Romans also thought that the eye would help keep their ships on course.

THE ROSTRUM

The rostrum was located at the front of the ship and would have been used to ram enemy vessels, either breaking the hull or the oars. It could be positioned either on the waterline or underwater, and as the quinquereme was a heavy ship it had the potential to sink an enemy vessel on impact.

THE MAINSAIL

Unfortunately, the specific details of quinqueremes remain unclear, although they definitely had at least one or even two sails. It is likely that the mainsail was eventually decorated with the SPQR emblem that was adopted during the Late Republic, around the 1st century BCE.

STRONG AND STEADY

The Roman quinqueremes were bigger than those built by the Carthaginians – according to Greek historian Polybius they were 45m long and 5m wide. Although this made the quinqueremes more difficult to manoeuvre it also made them more stable, particularly in bad weather conditions.

SIEGE VESSELS

If siege equipment was needed, two quinquereme ships could be joined together so that siege towers and large catapults could be ferried to the target. This was done during the Siege of Syracuse in 213 BCE, which took place during the Second Punic War.

TIGHT ON SPACE

The ship was designed to have up to 300 rowers onboard at once. This meant that often there was little to no room to carry any food or even the amount of water that the rowers needed – up to three litres a day per man. The crew would have likely eaten a diet consisting of hard biscuits, which did not spoil easily.

CREW ARRANGEMENT

Quinqueremes got their name because they were operated by oarsmen arranged in groups of five. It is thought that there were three banks of oars, around 90 on each side, with pairs of men on the top two rows and one man on the bottom.

FOREIGN MERCENARIES

Carthaginian citizens did not serve in their city's army except as officers. The bulk of Carthage's soldiers were foreign mercenaries recruited from across the Mediterranean. Usually these men were very capable and proved loyal – as long as they were paid.

LEGIONARIES ONBOARD

Republican Rome lacked specialised marines, so the soldiers who fought at sea were drawn from the legions. Ordinarily, there were 40 such legionaries on board, but when battle was expected this number would swell to 120.

PIRATE TACTICS

As well as favouring boarding actions, the Romans preferred prow-to-prow ramming as this placed fewer demands on their rowers, who were not as skilled and experienced as those of their Punic enemies. Once a Roman ship had rammed a Carthaginian vessel and dropped its corvus it would not let go until the enemy ship had been captured.

BOARDING BRIDGE

This 11-metre-long gangplank could be raised and lowered by means of a rope that was attached to the front via a pulley at the top of the pole. On each side was a knee-high railing. The corvus was wide enough to allow two men to cross abreast at the same time.

BATTLE OF ECNOMUS

CAPE ECNOMUS, SICILY 256 BCE

WORKHORSE WARSHIP

Both Roman and Carthaginian fleets used quinqueremes, a large war galley measuring about 44 metres in length. The ships were very similar because Rome reverse-engineered their design from a captured Carthaginian example. Each galley would have had 300 rowers aboard, with the men seated at three levels to either side.

In 275 BCE, the Roman Republic was the master of mainland Italy. But just across the Strait of Messina lay Sicily, a fertile island heavily settled by the Greeks. It was also home to a substantial number of Carthaginians. With an aptitude for trade and a vast commercial empire across the western Mediterranean, when the Romans looked out over the strait, they saw the looming threat from the Carthaginians, or Punics.

Meanwhile, the Mamertines, a group of Italian mercenaries, had seized power in the Sicilian city of Messina (modern-day Messina) in the 280s. They soon fell foul of King Hiero of Syracuse, who crushed them in battle in 264 BCE. They made appeals to Rome and Carthage for help and Carthage acted first, installing a small garrison in the citadel. Rome, fearing that Sicily would become the base for future Carthaginian attacks on Italy, also sent an army to the island. The Carthaginians were quickly ejected.

In this, the First Punic War, Hiero sided with the Romans, who quickly captured many Sicilian cities. At sea it was another matter entirely. The Carthaginian navy was bigger and better than Rome's and it would often appear offshore, scaring Sicilian cities into an alliance with them.

There was nothing Rome could do to stop this — until they realised they needed their own powerful navy. Using a captured Carthaginian quinquereme as a model, the industrious Romans constructed 100 copies, along with 20 smaller triremes, in just 60 days in 260 BCE.

The Romans knew that they were still no match for the Carthaginians in rowing. To better their odds they installed an 11-metre boarding bridge, known as a corvus, on each ship's bow.

Under the gangplank was a large, downward-pointing spike that embedded itself in the deck of enemy galleys. Once the ship was held fast, legionaries would rush across and capture it, turning a sea battle into a land one. Knowing that they were better in hand-to-hand combat, they packed their ships with 120 legionaries each so that they would have the edge.

In the Battle of Mylae, the first major naval battle the Romans ever fought, they clobbered a Carthaginian fleet that had challenged them with their new contraption. From then on Rome kept winning, but the land war dragged on. To break the stalemate, the Romans decided to strike Carthage itself and built a fleet of 330 ships in 256 BCE.

The Carthaginians responded by preparing 350 vessels. They intercepted the Romans off Cape Ecnomus on the southern coast of Sicily. Each quinquereme had some 300 rowers aboard. The Roman fleet boasted 138,600 rowers and legionaries all told, and the Carthaginians had 150,000 on their galleys. In terms of the number of men involved, Ecnomus may be the largest naval battle the world has ever seen.

The Roman fleet defeated Carthage's and an invasion army landed in Africa, but the Romans fumbled their chance, so the conflict would grind on for another 16 years until the last Carthaginian fleet was destroyed.

From then on, Rome ruled the waves. But their triumph would not guarantee lasting peace. Many in Carthage were deeply embittered by the harsh Roman peace terms. In time their unhappiness would manifest itself in the daring invasion of Italy by Carthage's most famous son, Hannibal Barca, who would smash several of Rome's armies during the Second Punic War.

"IN TERMS OF THE NUMBER OF MEN INVOLVED, ECNOMUS MAY BE THE LARGEST NAVAL BATTLE THE WORLD HAS EVER SEEN"



ROMANS

TROOPS 138,600

SHIPS 330



LEADERS

Roman co-consuls

Command of the Roman fleet at Ecnomus was shared between the two annually elected co-consuls of 256 BCE, Marcus Atilius Regulus (pictured) and Lucius Manlius Vulso.

STRENGTHS Vulso was a courageous and shrewd commander.

WEAKNESS Marcus Atilius Regulus was not especially wise.



ROMAN MARINES

KEY UNIT

Rome's marines came straight from the legions and were employed aboard ship in large numbers.

STRENGTHS Tough, aggressive and deadly close up.

WEAKNESS They were principally trained for land warfare.



CORVUS

KEY WEAPON

This hooked boarding bridge proved to be an outstanding success and allowed the inexperienced Romans to overcome the superior seamanship of the Carthaginians.

STRENGTHS Played to the Romans' preference for close combat.

WEAKNESS Only works if enemy targets are within range.

01 INVASION FLEET

The Romans approach from the east, heading west. The Roman First Squadron, under consul Lucius Manlius Vulso, forms the right of the Roman arrowhead. The Roman Second Squadron, led by co-consul Marcus Atilius Regulus, is on the left. Behind them is the Third Squadron, with the cavalry transports. Taking up the rear is the Fourth Squadron, also known as the Triarii.



02 THE CARTHAGINIAN LINE OF BATTLE

The Carthaginian fleet, under the overall command of Hamilcar, approaches from the west, heading east. The Carthaginian right wing, comprising about one-quarter of the Punic ships, is under the direct command of Hanno and is positioned slightly ahead and at an angle to the rest of the fleet.

03 FEIGNED FLIGHT

Hamilcar, in the centre of the Carthaginian line, begins a feigned flight, seeking to draw the leading Roman ships of the First and Second squadrons away. The Romans plunge ahead, following after the retreating Punic vessels. Once the Romans have done so, Hamilcar orders his ships to turn about and counterattack.



04 HANNO STRIKES

With the Roman First and Second squadrons chasing after Hamilcar's ships, a large gap opens between them and the Third and Fourth squadrons following behind. Seizing the opportunity, Hanno's right wing surges through the gap and attacks the Triarii of the Fourth Squadron. Meanwhile, the Carthaginian left wing attacks the Roman Third Squadron and its horse transports.

05 HAMILCAR FLEES

Despite the success of his ploy, Hamilcar's ships are no match for the Romans and their boarding bridges. The battered Carthaginians in the centre flee the scene. Vulso sweeps up the captured galleys while Regulus turns around and goes to help the hard-pressed Third and Fourth squadrons. Hanno's squadron is stuck between the Roman Fourth Squadron and Regulus' oncoming ships and chooses also to flee by rowing out to sea.

06 TRAPPED BY THE SHORE

The Roman Third Squadron is trapped against the Sicilian shoreline by the Carthaginian left wing. Only fear of the boarding bridges saves them from being immediately overwhelmed, as the Carthaginians are reluctant to come within range and become stuck fast by them. This delay gives the Roman ships under Vulso and Regulus time to come to the rescue. The Carthaginians have nowhere to run and no fewer than 50 Punic vessels are captured here.

07 ROMAN VICTORY

The battle is a clear-cut victory for the Romans as they sink 30 Carthaginian galleys while losing 24. They also capture 64 enemy warships all told, while none of their own are taken.

THE CARTHAGINIANS

TROOPS 150,000

SHIPS 350



LEADER

Hamilcar

Hamilcar's plan to lure the Roman fleet away from the rear divisions was a good one, even if it ended up failing.

STRENGTHS Bold and cunning with a strong grasp of tactics.

WEAKNESS Was unprepared for Rome's new corvus gangplank.

CARTHAGINIAN MERCENARIES

KEY UNIT

Wealthy Carthage relied on hired soldiers to fight its battles. These men were drawn mainly from Africa, Spain and Gaul.



STRENGTHS Professional and talented soldiers.

WEAKNESS They weren't as highly motivated as the Romans.



CARTHAGINIAN QUINQUEREME

KEY WEAPON

The Carthaginian war galley was a sleek and well-constructed craft, similar to that used by the Romans but of better quality.

STRENGTHS Fast and agile. Carthaginian rowers were better than their Roman counterparts.

WEAKNESS Had trouble in defending against Roman boarding attacks.

Great Battles



THE BATTLE OF ACTIUM

OCTAVIAN AND AGRIPPA TAKE ON THE INFAMOUS ANTONY AND CLEOPATRA
NEAR EPIRUS, GREECE, 2 SEPTEMBER 31 BCE

Following a struggle for power over Rome, former triumvirs Octavian and Mark Antony (the latter based in client-kingdom Egypt) faced each other in battle at sea near the city of Actium, off the coast of Epirus. Antony had the advantage of experience, bigger and heavier ships, and greater manpower, but Agrippa, Octavian's general, held the fierce loyalty of the Roman soldiers at his command. The fate of the Roman Republic lay in the balance.

01 ANTONY PREPARES AT ACTIUM

Antony's warships wait at the harbour. He has ordered full sail on his ships, which is strange, as sails are for cruising, not fighting, where rowers are used. His 250-ton quinqueremes are weighted with iron plating and bronze spikes for ramming, with eight and ten banks of oars.

02 OCTAVIAN AND AGRIPPA'S FLEET

Octavian's 250 ships are small, but he has the advantage of speed and manoeuvrability with his well-trained and disciplined crews, especially in stronger tides nearer the harbour. Antony's superior ships are under-manned by inexperienced 'mule-drivers, farmers, and boys'.





All the ships left behind by Antony were either captured or sunk

THE AFTERMATH OF ACTIUM

As a battle, Actium wasn't actually that spectacular: full of idling, false starts and delays. Had Antony seized his chance months earlier and taken Octavian and Agrippa's troops in a land battle, he'd have been the victor easily. Historian Plutarch, who was more interested in Octavian's moral superiority than tactics, weapons and battle plans, assures us that Antony was too besotted with Cleopatra to succeed and that he arrogantly desired to meet Octavian at sea. The consequences of Actium are more impressive: they were and are literally the stuff of Hollywood, as Cleopatra subsequently cut a deal

with Octavian in which she betrayed Antony and manoeuvred him into killing himself. She then cheated Octavian of his triumphal prize of a defeated queen to display in Rome with her own dramatic suicide. With Antony defeated and Egypt annexed (after the Battle of Alexandria in 30 BCE, where all of Antony's ships sailed out to meet Octavian's and simply joined his side), Actium became a pivotal landmark in Roman history, signifying Octavian's victory over the last of his great rivals, bringing to an end a century of civil war, and taking control of the Roman Republic. The way that Rome would be ruled changed forever.

03 BATTLE LINES ARE SET

Octavian's line of ships faces his enemy's, with the left wing led by Agrippa and the right by Octavian. He plans to surround Antony's ships and fight at close quarters with swords and shields. Antony draws his ships tightly together, hoping to lure Octavian closer and drive his ships against the shore.

04 ANTONY BOOSTS MORALE

Antony rallies his troops as his 500 ships face the Roman fleet: they can rely on their weight even if they lack the manpower to reach ramming speed. Octavian fears direct engagement with these juggernauts, as clashes would easily shear off the prows of his lighter-weight ships. Cleopatra's navy supports Antony's to the rear.

05 MORNING: HOURS OF WAITING

The fleets sit idle until midday, when the tides make the wings on the lines slowly drift, creating gaps in each line. Thanks to a defector, Octavian knows Antony's strategies; his ships stay out of range, while he orders his right wing to row backwards to lure Antony into deeper water.

06 THE SHIPS ENGAGE

As the fleets come within range of each other, Octavian's ships sail in quickly to fire volleys of darts at the enemy, then row away with as much speed as possible. Antony's ships have iron grappling hooks that can be launched and used to pull the boats together.

07 MISSILE FIRE

Wicker shields protect Antony's men from the blows of spears and poles, so the Romans fire flaming missiles into his ships. He retaliates by ordering his catapults to fire on the Romans from high up in wooden towers on the ships.

08 CLEOPATRA CHANGES THE PLAN

In the heat of battle, Cleopatra's ships suddenly cruise forward, heading towards the Roman lines. She soon gives the signal to retreat, which Antony doesn't see. In the confusion, Antony thinks the Egyptians are panicking due to defeat; he abandons his fleet to join her.

09 ANTONY'S NAVY FIERCELY BATTLES ON

Unaware that their general has left, Antony's forces fiercely continue the battle, firing missiles and clashing with swords as the enemy boards their ships. Some boats are set on fire while others concede and throw their weapons overboard as they try to set sail to escape.

"SOME BOATS ARE SET ON FIRE WHILE OTHERS CONCEDE AND THROW THEIR WEAPONS OVERBOARD AS THEY TRY TO SET SAIL TO ESCAPE"

10 THE LEADERLESS SURRENDER

For several hours Antony's fleet fight valiantly against Octavian, but they surrender after a sudden gale batters the ships. 300 ships are captured or sunk and 5,000 men lost. The remaining generals surrender that evening when they realise Antony really has abandoned them.

THE AGE OF SAIL

THE HEIGHT OF NAVAL WARFARE GAVE RISE TO CUTTING-EDGE SHIPS, HISTORY-MAKING ENGAGEMENTS AND THE FINEST ADMIRALS EVER TO SET SAIL

34 Hayreddin Barbarossa

Dedicated to the Ottoman cause, one man would rise from slavery to become the scourge of the Mediterranean

40 The Mary Rose

Come aboard King Henry VIII's famous flagship, a vessel that served England for over three decades

42 Battle of Gravelines

Scattered by English fireships off the coast of Belgium, the Spanish Armada had no choice but to fight its way out

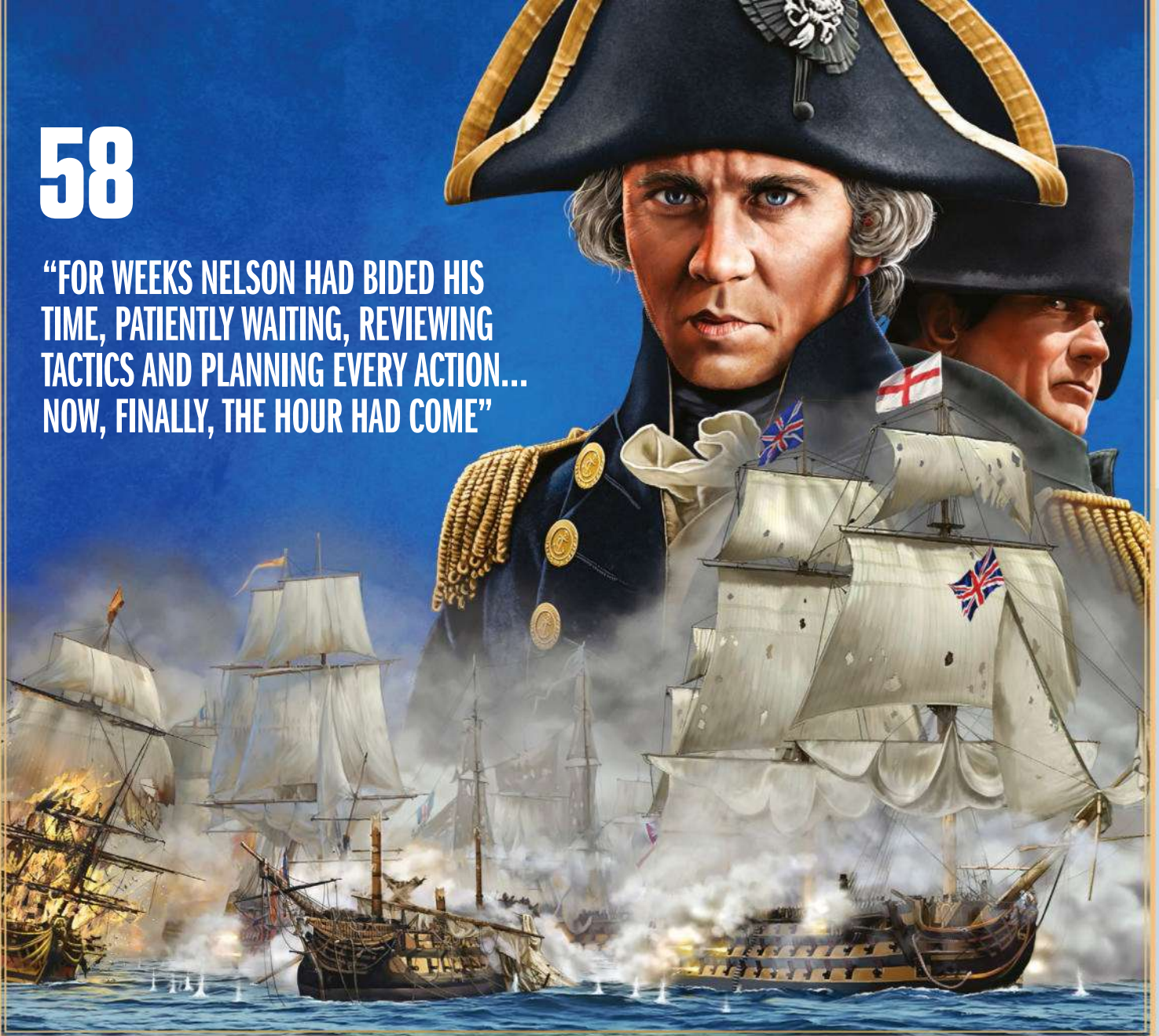
48 Battle of Lepanto

Immerse yourself in the battle that halted Ottoman expansion

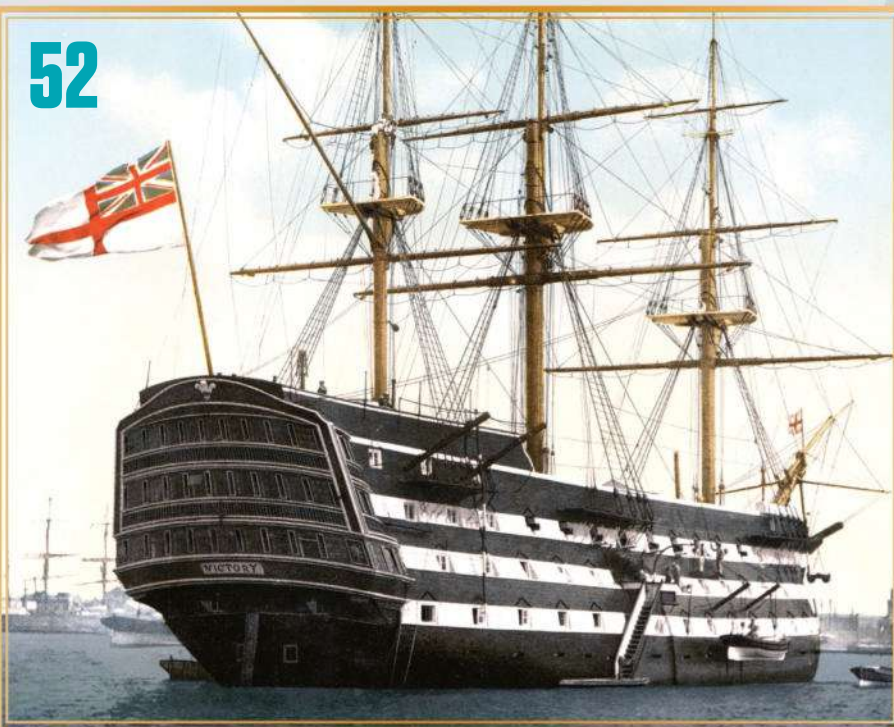


58

“FOR WEEKS NELSON HAD BIDED HIS TIME, PATIENTLY WAITING, REVIEWING TACTICS AND PLANNING EVERY ACTION... NOW, FINALLY, THE HOUR HAD COME”



52



52 Man-of-war

Explore the mighty warship that would come to dominate the seas for three centuries

54 Admiral Yi Sun-sin

Faced with seemingly insurmountable odds, Korea prepared to go down fighting in its struggle with Japan. And then a hero of superhuman talent and courage stepped forth to defend his people

58 Nelson and the Battle of Trafalgar

Meet the brilliant commander behind Britain's greatest-ever military triumph, a resounding victory that would spare her from invasion and frustrate the ambitions of Napoleon

HAYREDDIN BARBAROSSA

THIS PREDATOR OF THE SEAS ROSE FROM CORSAIR CAPTAIN TO
GRAND ADMIRAL, BECOMING A MASTER OF GALLEY WARFARE

WORDS WILLIAM E. WELSH

Shouts of joy rose from the docks of the port of Mahon in the Balearic Islands on an October day in 1535, as the galleys of a powerful squadron flying Spanish flags glided into the turquoise waters of the harbour. Church bells tolled a hearty welcome, and a Portuguese caravel lying at anchor fired a salute to welcome the triumphant squadron.

Four months earlier, the Spanish king, Charles I, had led a great armada to Tunis. In a month-long battle, he drove Turkish Grand Admiral Hayreddin Barbarossa from the port. The notorious Barbarossa was rumoured to be dead. The inhabitants of the Balearic Islands had suffered mightily as targets of the red-bearded corsair's raids in the preceding years, and they celebrated his demise with relish.

Suddenly the arriving galleys began firing their bow cannons at the caravel. Shock registered on the faces of the Christians on the quay and aboard the caravel.

Swarms of Turkish troops emerged from their hiding places behind the bulwarks of the galleys. They clambered up the sides of the Portuguese caravel and thronged onto the quay. By then the inhabitants of Mahon had discerned that the Spanish flags were a ruse. The commander of the squadron was not a friendly Spanish admiral but the fearsome Barbarossa. The Ottoman admiral stayed long enough to round up 1,800 Christian captives to be sold in the slave markets of Algiers.

Just before he departed, the burly Ottoman admiral left a note pinned to the tail of a horse. "I am the thunderbolt of heaven," the note boldly stated. "My vengeance will not be assuaged until I have killed the last one of you

and enslaved your women, your daughters and your children."

Spanish presidios

Following the conclusion of the Spanish Reconquista, which ended with the subjugation of the Emirate of Granada in 1492, the more than 500,000 Muslims living in Spain faced increasing pressure to convert to Christianity. In 1502, Queen Isabella of Castile issued them an ultimatum: convert to Christianity or leave Spain. The departing Moors found their way by boat to the Maghreb (literally meaning 'the west'), the region that included modern Morocco, Algeria and Tunis. The Europeans called this area the Barbary Coast.

The Maghreb at that time was experiencing a power vacuum. The three Berber kingdoms in existence at the outset of the 16th century were in steep decline. Unrest existed between the Berbers and the Arabs living in the region. The arrival of the Spanish Moors in the Maghreb, coupled with the emergence of corsairs from the Levant, further de-stabilised the region. The Berber kings could do little to discourage the corsairs, who operated not only from ports and harbours but also from coves and inlets along the 1,900 kilometres of Maghreb coastline. The corsairs posed a threat to Spanish shipping, as well as coastal towns and villages throughout Spain, Italy and the nearby islands.

The guiding force behind the Spanish initiative to establish a string of fortified outposts, or presidios, along the Maghreb coast to deter the corsairs was Archbishop Francisco Jiménez de Cisneros, who swore to

Queen Isabella that he would do his utmost to stamp out the corsair threat.


Jiménez's containment policy reached its pinnacle between 1508 and 1510 when skilled military engineer Count Pedro Navarro oversaw the capture of half a dozen key ports, including Algiers, Tripoli and Tunis, as well as the construction of presidios at locations where their guns could command the harbour. Some of the more famous presidios were built atop rocky islands known as peñóns.

Following Isabella's death, Jiménez kept King Ferdinand focused on the containment policy. When King Charles I (the future Habsburg Holy Roman Emperor Charles V) took the throne in 1516, he inherited the corsair problem.

War in the Maghreb

In 1502, two brothers, Oruç and Khizr, arrived in Tunis to prey on Latin shipping. Like other Ottoman corsairs, they used oared warships known as galliots, which were miniature versions of the galley. A galliot had two lines of rowing benches, a lateen sail and a centreline bow cannon. In addition to the small crew, a galliot might have an average of 60 rowers and 40 soldiers.

Hailing from the Ottoman-controlled island of Lesbos, the brothers were sons of a former Ottoman soldier and his Greek Christian wife. Despite their mother's religion, they were raised as Muslims. Both brothers had red beards, which prompted the Europeans to call them the 'Barbarossa' (redbeard) brothers. While living on Lesbos, Oruç had been captured by the Knights of St. John and forced to serve



Barbarossa is shown lavishly dressed, as befitted his position of grand admiral of the Ottoman Imperial Fleet. The barrel-chested former corsair sports the full red beard that prompted Europeans to call him Barbarossa (redbeard). He wears a ceremonial turban that is decorated with jewels, topped by a miniature crown denoting his high rank. He also wears a surcoat adorned with the Ottoman crescent over a luxurious caftan with matching sash, under which is protection consisting of a composite of mail with small plates protecting his torso. At his waist is a hawk-handled scimitar in a jewelled scabbard.

“WHILE LIVING ON LESBOS, ORUÇ HAD BEEN CAPTURED BY THE KNIGHTS OF ST. JOHN AND FORCED TO SERVE FOR THREE YEARS AS A GALLEY SLAVE. HE ESCAPED AND RETURNED TO LESBOS WITH A BURNING HATRED OF CHRISTIANS”

for three years as a galley slave. He escaped and returned to Lesbos with a burning hatred of Christians. Shortly thereafter, he and Khizr sailed to Tunis.

By dint of exhaustive raiding, the brothers amassed considerable wealth. During the period in which the Spanish established control of the principal ports of the Maghreb, the Barbarossas shifted their operations to Djerba, an island approximately 480 kilometres south of Tunis with a deepwater lagoon on the west side that could shelter an entire fleet. Unlike in Tunis, they could operate in Djerba free of interference from local rulers. Because the heavily gunned Spanish vessels that prowled the Barbary Coast were too strong for the Barbarossas to engage they focused their efforts instead on plundering vessels of Genoa, Tuscany, Sicily, Naples and the Papacy.

Oruç thirsted for greater power, and it proved his undoing. When the city of Bougie in central Maghreb requested assistance in ousting the Spanish, he launched an amphibious attack against it in August 1512. While leading a charge through a breach in the city's walls his arm was torn off by a cannonball.

Having survived his grave injury, Oruç received a silver prosthetic arm, and he soon returned to fighting the Spanish in the hope of carving out his own fiefdom. He captured the ancient

Maghreb capital of Tlemcen in 1516, but the Spanish viceroy of Oran, Diego de Vara, retook it after a six-month siege. Oruç fled with his followers, but the Spanish overtook them and slaughtered them. De Vara sent Oruç's skull and crimson cloak to Spain, where they were displayed in Córdoba Cathedral. Following his brother's death, Khizr Barbarossa became the top sea wolf in the Mediterranean.

Bey of Algiers

Realising he was outgunned by the Spanish with their royal galleys and near-impregnable presidios, Barbarossa sent an envoy to Ottoman Sultan Selim I with an appeal for protection. Selim agreed in 1519 to accept Algiers as a sanjak, or province, in exchange for military support. This elevated Barbarossa to the post of Bey of Algiers. He received 2,000 janissaries and 4,000 other troops, as well as artillery, to form the initial core of his provincial army. The following year Sultan Suleiman I succeeded Selim. He kept a watchful eye on Barbarossa to see how well he performed his duties.

Barbarossa had a broad chest, thick beard and dark, piercing eyes. He could be as brutal as his late brother Oruç, but he also possessed sharp political skills. Unlike Oruç, Khizr had no desire to carve out his own fiefdom – he was entirely devoted to the Ottoman sultan.

The most pressing problem he faced as Bey of Algiers was how to drive the Spanish from the presidio that controlled Algiers harbour.

In August 1519, King Charles, who had been elected Holy Roman Emperor two months earlier, dispatched the Viceroy of Naples, Hugo de Moncada, with a Spanish fleet of 40 ships and 5,000 troops against the port city of Algiers. The Spanish still held their presidio, known as the Peñón of Algiers, situated on a small islet 275 metres offshore from the picturesque port city. Barbarossa repulsed Moncada's attempts to storm Algiers. A fierce gale also arose that wrecked 26 of the 40 Spanish ships. Moncada had no choice but to withdraw, leaving the Ottoman corsairs in possession of the city.

Restless Berbers who were disgruntled by the presence of the corsairs in Algiers revolted in 1524, driving Barbarossa out. He returned to Djerba, from where he could continue raiding Spanish and Italian shipping and also launch amphibious assaults to capture the remaining Spanish presidios scattered throughout the Maghreb. By that time, Barbarossa had 40 captains serving under him.

Barbarossa bided his time, waiting for an opportunity to return to Algiers. He made his move in May 1529 when he landed with troops and artillery and retook the city. He intended, upon recapturing the city, to destroy the Peñón of Algiers. The garrisons of the Spanish presidios along the Barbary Coast were despised by Berbers and Arabs alike and therefore were unable to purchase supplies from the locals. When Barbarossa returned, the Spanish garrison was awaiting resupply. The convoy of ships bearing supplies was long overdue.

The swift-moving Ottoman galleasses and galliots swarmed the sail-driven Holy League ships at the Battle of Preveza when the wind dropped



NAVAL CLASH AT PREVEZA

OTTOMAN ADMIRAL HAYREDDIN BARBAROSSA OUTWITS HOLY LEAGUE ADMIRAL ANDREA DORIA IN A SHOWDOWN IN THE IONIAN SEA, SEPTEMBER 1538

01 The Christian fleet assembles off the coast of Preveza on 2 September. The Spanish viceroy of Naples disembarks a portion of his 16,000 men from the roundships to launch an attack on 23 September against the Ottoman-held castle of Preveza. His objective is to capture the fortress, destroy the Ottoman shore batteries and bring Spanish guns to bear on Hayreddin Barbarossa's fleet inside the gulf. Supported by siege guns, the troops assail the fortress for three days.

03 Ottoman Admiral Hayreddin Barbarossa brings his fleet to the mouth of the Gulf of Preveza. Both sides square off in line of battle, but for some inexplicable reason neither attacks. Barbarossa then retreats into the gulf, where the galleys are beached, with their bows facing outwards so that their guns can repulse an attack.

02 Ottoman infantry and cavalry stationed in Aetolia conduct a forced march to relieve the fort. The Ottoman counterattack on 25 September compels the Holy League admirals to reconsider their land attack. The Spanish viceroy wants to persist with the attack, but Admiral Andrea Doria holds a council of war and the viceroy is overruled.

04 Doria is unwilling to expose his galleys to destructive fire from a gauntlet of Ottoman guns by entering the narrow entrance of the Gulf of Preveza. The lateness of the year exposes the Christian fleet in the open sea to the threat of possible destruction from storms, which bear down from the northwest. He issues orders on the evening of 26 September for a withdrawal to begin the following morning.

06 Captain Alessandro Bondulmier's Great Galleon of Venice is the first of the Christian ships to come under attack by the pursuing Ottoman galleys. Despite its slow speed, the great galleon is heavily built and well gunned. The galleon succeeds in disabling a number of Ottoman galleys.

05 The wind drops on the morning of 27 September, and the Christian fleet becomes strung out as it moves south, with the galleys to the south and the roundships trailing far behind. Barbarossa's galleys emerge from the Gulf of Preveza and form a crescent. By mid-morning they are in position and advance in formation towards the Christian roundships.

07 The lack of wind prevents the sail-driven Christian galleons from making a timely escape. The bow guns of Barbarossa's galleys pummel the roundships, inflicting substantial damage and sending some of the Spanish soldiers onboard to the bottom of the sea.

SANTA MAURA

08 The captains of the Venetian galleys, who stand to lose the most from an Ottoman victory, turn back to engage the Ottoman galleys. Their crews fight like lions. The Ottomans sink two Holy League vessels and capture five at the cost of three of their own vessels. At nightfall the wind picks up and the Christian roundships make good their escape.

SCATTERED CHRISTIAN GALLEYS ATTEMPTING TO REFORM

GULF OF PREVEZA

CASTLE OF PREVEZA

PROBABLE CHRISTIAN ANCHORAGE

GREEK MAINLAND

GREAT GALLEON OF VENICE

DISTANCE IN MILES
0 1 2 3 4 5

MUSLIM MOVEMENTS

CHRISTIAN MOVEMENTS

MUSLIM BATTERIES

PROBABLE MUSLIM ANCHORAGE

Barbarossa moved quickly. As soon as his siege guns were in position, he began bombarding the presidio. After two weeks of sustained shelling, the heavy guns opened a breach wide enough for the Turks to charge through it. Governor Don Martin de Vargas promptly surrendered, having lost three-quarters of his men. Barbarossa put the captured soldiers to work with other Christian slaves dismantling the fort, so that it would never again house Spanish troops. Under the Bey of Algiers's watchful eye they used the stones to build a breakwater, stretching from the mainland to the islet, to protect his fleet from the powerful northern and westerly winds.

During this time Barbarossa frequently plundered the coast of Spain. He also evacuated Moriscos (Moors compelled to convert to Christianity) who wanted to escape intolerant Spain. He made sure to stay in the good graces of Sultan Suleiman by sending a portion of his booty to the Sublime Porte. Suleiman considered him an able administrator and superb naval commander. As a sign of respect, Suleiman bestowed on him the complementary Islamic honorific 'Hayreddin', meaning 'goodness of the faith'.

Hayreddin's capture of Algiers coincided with the Peace of Cambrai in 1529 between French King Francis I and Holy Roman Emperor Charles V. The defeated Francis had to relinquish all claims to Italy. To make matters worse, Genoan Admiral Andrea Doria quit French service in order to command Charles's Spanish fleet.

Sultan Suleiman's admiral

Suleiman summoned Hayreddin to Istanbul in 1532 to oversee the construction of a new

imperial fleet. The sultan and admiral were in agreement that the Ottomans needed to capture Tunis and destroy Doria's Spanish fleet. While Hayreddin was in Istanbul, Doria had conducted a successful raid against an Ottoman squadron in September 1532, capturing the fortress of Coron on the southern tip of Morea (part of the Peloponnese).

The following year Suleiman promoted the Bey of Algiers to the exalted post of grand admiral. The shipbuilding initiative produced 70 galleys, each of which was outfitted with one bronze cannon in the bow. The mighty fleet departed from the Golden Horn in 1534. After raiding Calabria, it turned south for Tunis. The presidio at La Goulette (the gullet) guarded the channel leading to the harbour at Tunis. The troops disembarked on 16 August and quickly gained possession of Tunis. The ruling Berber prince, Mulei Hassan, fled.

After the fall of Tunis to Hayreddin, Hassan implored King Charles to help him recover the city. No sooner had Charles received the request than he began assembling forces for an operation he intended to lead himself. The

emperor's 500-ship armada weighed anchor near Tunis on 13 June 1535.

Hayreddin knew that he could not hold Tunis, but he put up a spirited defence anyway. Charles landed his troops a short distance from La Goulette. It took the Spanish army 24 days of constant fighting to capture the twin towers at La Goulette. To his credit, Hayreddin safely withdrew his surviving troops. However, Charles succeeded in destroying 82 Ottoman vessels.

War with Venice

Charles' decisive victory at Tunis did little to calm the feeling of insecurity and dread that gripped those living along the coast in Spain, Italy and the Christian-held islands of the western Mediterranean. They lived in constant fear of attack by Hayreddin's fleet and Ottoman corsairs.

King Francis encouraged Suleiman to send vessels to assist him in his operations against Charles. Although the French had a fleet, it had recently been defeated by Doria. Suleiman duly obliged him, as he harboured dreams of capturing Rome one day. They hashed out a plan whereby Francis would attack into northern Italy and the Turks would land in Apulia and push north. An Ottoman squadron arrived in Marseilles in 1536, but Francis soon grew skittish about conducting joint operations with the Turks against fellow Christians. This diminished the French king significantly in the eyes of the Ottomans.

Suleiman unleashed Hayreddin to wreak havoc against Charles' Italian domains. The Ottoman admiral, who the Christians called the 'King of Evil', proceeded to ravage Apulia.

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UNHOLY ALLIANCE

BARBAROSSA RELUCTANTLY CO-OPERATED WITH THE FRENCH IN AN ATTACK AGAINST NICE DURING THE SHORT-LIVED FRANCO-OTTOMAN ALLIANCE

More than 110 Ottoman galleys carrying 30,000 troops led by Grand Admiral Hayreddin Pasha sailed into the French port of Marseilles on 21 July 1543 for the purpose of conducting a joint operation against their mutual enemy, Holy Roman Emperor Charles V.

To his disgust, the Ottoman admiral found the French unwilling to embark on an attack directly against Charles' dominions in Italy as previously discussed. Instead, the French had decided to attack Nice, which belonged to Duke Charles of Savoy, one of Charles' allies. The Ottoman admiral was furious as he believed the French were squandering a great opportunity by attacking such a minor objective.

The attack began a month later. Turkish batteries blasted a breach in the outer walls of the town through which French troops poured. But the combined army failed to capture the citadel. When Francois de Bourbon, Count of Enghien, learned that a relief army was on its way, he ordered a withdrawal. The French troops sacked the lower town, yet the Ottomans were blamed for it.

Grand Admiral Hayreddin Pasha led an armada of 110 ships to Marseilles only to learn that the French wanted to avoid attacking Habsburg lands





Images: Alamy

Ottoman corsairs in oar-driven warships known as gallies attack a powerful Spanish galleon along the Barbary Coast

Hayreddin sailed from Istanbul in May 1537 with 170 galleys and support ships bound for Apulia. Over the course of a month he torched towns, destroyed forts and carried off thousands of Christians to be sold as slaves.

In 1537, the Venetians and Ottomans went to war with each other for the third time. Suleiman ordered Hayreddin to capture the Venetian citadel at Corfu, which if seized could serve as a forward base for an invasion of Italy. But the Venetians had made significant improvements to the citadel, and Hayreddin judged it impervious to his siege artillery. He therefore concentrated on mopping up Venetian outposts in the region. He attacked 25 strongholds on the Aegean islands and Morea. Of the 25 outposts, he destroyed 13 and compelled the other 12 to pay annual tribute to the sultan.

While the Ottomans were preoccupied with Venice, Emperor Charles sent envoys to Hayreddin with an invitation to abandon Ottoman service in favour of becoming a Habsburg admiral. Hayreddin strung him along, all the time keeping Suleiman apprised of the negotiations. As a devout Muslim, Hayreddin had no intention of leaving Ottoman service.

Invincible admiral

Sultan Suleiman launched an offensive that same year, designed to secure the Ionian Sea and the Strait of Otranto for future operations against Italy. To counter the threat, Pope Paul III established the Holy League in February 1538. The pope placed Genoan Admiral Andrea Doria in charge of the vast Christian armada that

included fleets from Genoa, Venice, Naples, Malta and the Papacy. Doria's 130 galleys and 50 galleons met Hayreddin's 50 gallies and 90 galleys in battle near the entrance to the Gulf of Preveza on 28 September 1538. Because of the impregnable position of Grand Admiral Hayreddin Barbarossa's galley fleet, Doria attempted to withdraw without fighting; however, the Ottoman galleys caught his sail-driven galleons when the wind dropped. The Ottomans inflicted greater losses on the Christian fleet than they received from it.

In the aftermath of the Ottoman victory at Preveza a fierce storm drove Hayreddin's imperial fleet up the Adriatic coastline, destroying half of his vessels. Afterwards, he returned to Istanbul to build more galleys.

Hayreddin's next noteworthy expedition came in 1543 when he led a large galley fleet to Marseilles to participate in joint operations with the French. An amphibious attack on Nice failed when Franco-Ottoman troops couldn't capture the port city's strong citadel.

After supporting the French in their failed attack on Nice in the summer of 1543, King Francis billeted the Ottoman fleet in Toulon. When they could not agree on an objective in spring 1544, Hayreddin led his fleet out

of French waters. Determined to come home to a hero's welcome, Hayreddin spent the summer of 1544 using his fleet and troops to methodically pillage Campagna, Calabria and Sicily. Although the inhabitants of southern Italy had built watchtowers along hundreds of kilometres of coastline, they did little good as there were no local forces sizable or powerful enough to check the Ottoman raiders. Hayreddin's last raid was marked by sadism and cruelty designed to undermine the faith of Christians in their God. In some cases, entire villages were wiped off the map.

Hayreddin's fleet carried 6,000 Christian captives back to Istanbul. It was to be his last great raid, as two years later he died of a fever in his seaside palace in Istanbul.

Barbarossa's life was remarkable (if brutal) given that he rose from modest beginnings to one of the highest posts in the Ottoman Empire. He showed during the height of his career that he understood the advantages and limitations of galley warfare.

He was revered for his military achievements across the Muslim world and despised for his cruelty throughout the Christian one. He remains a celebrated figure in the Turkish psyche today.

“HAYREDDIN'S FLEET CARRIED 6,000 CHRISTIAN CAPTIVES BACK TO ISTANBUL. IT WAS TO BE HIS LAST GREAT RAID, AS TWO YEARS LATER HE DIED OF A FEVER IN HIS SEASIDE PALACE IN ISTANBUL”

THE MARY ROSE

HENRY VIII'S FLAGSHIP IS FAMED FOR ITS DEMISE, BUT THE SUBJECT OF THE LARGEST MARITIME ARCHAEOLOGICAL EXCAVATION EVER UNDERTAKEN HAS MUCH MORE TO IT THAN MEETS THE EYE

THE MARY ROSE

TYPE OF SHIP: Carrack, warship

ORIGIN: Portsmouth, Hampshire, England

COMMISSIONED: 1511

LENGTH: 45m

CREW: 415 (excluding officers and retainers): 200 mariners, 30 gunners, 185 soldiers

ARMAMENT:

250 longbows, 9,600 arrows
50 handguns

150 boarding pikes
150 bills

3 large incendiary darts
91 guns:

15 carriage-mounted cast-bronze muzzleloaders
24 carriage-mounted wrought-iron breechloaders
30 wrought-iron breech-loading swivel guns
20 hand-held/ship-supported cast-iron muzzleloading guns
2 top guns

NETTING

Netting strung above the upper deck between the castles was a deterrent to boarders but also prevented the crew escaping as the ship sank. Of the 500 men onboard, only between 30 and 35 survived.

ANTI-BOARDING MEASURES

Spot finds of archery equipment on the upper deck in the waist of the ship indicate that archers were moving about during the battle in anticipation of close-quarters actions and anti-boarding manoeuvres.

BLINDS

Some of the 'blinds' in the waist of the ship on the upper deck were removable so archers and soldiers with handguns could be positioned there.

GUN DECK FIREPOWER

Seven broadside guns were stationed at lidded gun ports supporting a mixture of cast-bronze muzzleloaders and wrought-iron breechloaders. During the excavation, all were found still sitting on their wooden carriages.

REASON FOR SINKING

The Mary Rose sank due to water pouring in through her starboard gun ports. The gun port lids were found open and hinged back against the side of the ship.

SHOT LOCKERS

The three main shot lockers. 1,248 cast iron shot, 387 stone shot, composite shot and canister shot have been found during excavations.

LOGS

Substantial amounts of quartered logs were found, which was a store of wood for the Mary Rose.

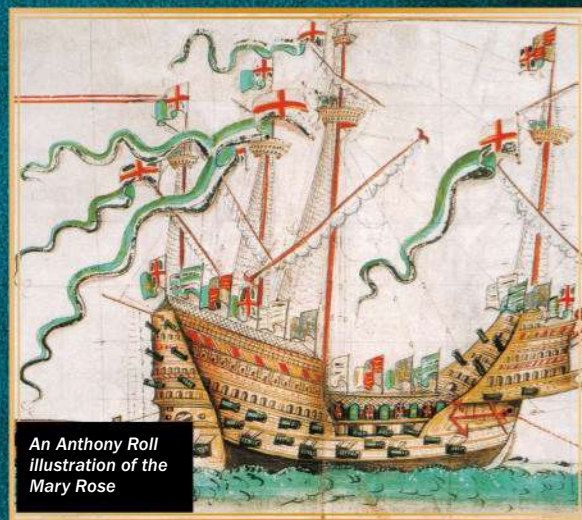
FOOD STORES

Butchered half carcasses of pork (headless and split down the centre) were found in one area. The position they were in suggested that they had been hung and were probably salted.

THE RISE AND FALL OF THE MARY ROSE

Henry VIII came to the throne in 1509; a year later work began on two new ships. It is believed that the Mary Rose was one. During his reign, Henry increased the British fleet from four vessels to 58, and 20 of these were great ships (four-masted warships). The Mary Rose was the second largest of these. Its lifespan somewhat mirrors the reign of the king (1509-47), as it sank on 19 July 1545 defending the English coast from a French invasion force larger than the Spanish Armada. This was a short period of intense change, with a dramatic shift in the types of guns and the nature of warfare.

Ships used to employ the tactic of very short-range bombardments followed by boarding, but the change brought longer-range warfare where the ships would move closer. There was still some close-quarters conflict, as demonstrated by the numbers of longbows and staff weapons carried onboard. Ships like it, with the capability of at least a partial broadside, marked the beginning of a type of warfare that was to endure until the middle of the 19th century. The Mary Rose, with her incendiary darts, longbows and long-range culverins, was indeed a ship of a transitional era.



An Anthony Roll illustration of the Mary Rose

FORWARD-FIRING CAPABILITIES

Due to the shape of the hull, the ability to fire ahead was limited. The main forward-firing capability was through cast bronze culverins on the castle deck facing forward at the front of the sterncastle.

CAST-IRON GUNS

Four of the 20 'hailshot pieces' listed for the ship were found. These guns are the first evidence of the mass production of cast-iron guns in England. With a rectangular bore they fired small iron dice at short range.

GUN DECK CABINS

The main gun deck was not only a fighting area. Cabins for the navigator, surgeon and carpenter were also located on this deck.

ARCHERS, BOWS AND ARROWS

For the battle, chests of bows and arrows had been taken up from the main archery store on the orlop deck in the stern to the upper deck just inside the sterncastle, the muster station for the archers.

MATCHLOCK ARQUEBUSES

Parts of five of the 50 handguns listed for the ship were found. Three are snap matchlock arquebuses imported from the town of Gardone in Italy. Historical documents verify that 1,500 were imported in 1544 in preparation for the war with France.

IRON GUNS

The ship represented the most advanced weapons systems of its time. Breechloading, the iron guns could fire solid limestone shot or, at closer range, canisters filled with flakes of flint or pebbles.

INCENDIARY DARTS

Three long darts with incendiary sacks bound close to their heads were found beside a large gun on the main deck.

ENGAGING THE FRENCH

The Mary Rose did engage with the French; some of her guns had been fired and one was being reloaded as the ship sank.

SHIP'S OVENS

The galley consisted of two brick 'ovens' located in the centre of the ship in the hold. Copper alloy cauldrons enabled the cooking of a large amount of broth, while haunches of meat could be dangle-roasted in front of the oven.

UNIQUE GUN SHIELDS

Remains of eight shields with breechloading handguns mounted centrally within them were found in store on the orlop deck. These have never been known in a combat situation before and were previously thought to be the preserve of the King's Royal Guards.

**STRIPED ENSIGN**

Along with the St George's Cross of England's patron saint, English ships sailed into battle under a striped ensign that denoted different squadrons. This made it easier for commanders to keep track of the battle and for captains to ensure they were in formation amid the smoke, fire and chaos of a close-quarter naval engagement.

Great Battles**BATTLE OF GRAVELINES**

**ENGLISH CHANNEL,
JULY-AUGUST 1588**

WORDS CHARLES GINGER

As has often been the case throughout the history of empires and conquest, it was a combination of greed, self-righteousness and a desire to punish a troublesome neighbour that inspired King Philip II of Spain to attempt to invade England in 1588.

As ruler of the largest empire in the world at the time, Philip's power was unrivalled, but this didn't translate into a reign of peace and contentment for his subjects, especially those residing in the Netherlands. A Spanish possession when its crown passed to King Philip II in 1556, since 1568 the Netherlands had been in revolt against its foreign overlords. However, it was not alone in its efforts; a neighbour to the northwest was all too willing to provide aid: England.

Such a blatant disregard for his rule and the sovereignty of his sprawling empire was never going to be ignored by Philip, and when Elizabeth I opted to relieve Mary, Queen of Scots (a devout Catholic) of her head, King Philip's restraint snapped. The Protestant thorn in his side would have to be removed, and the only way to extract it would be to invade England and restore Catholicism to its people, many of whom Philip believed would rise up in support of their religious saviours as they landed on the English coast. He also had the express support of Pope Sixtus V, who viewed the entire enterprise as a crusade, an electric word bound to invigorate the men set to embark on it.

Such an undertaking was never going to be a simple one, and a vast and well-supplied fleet

THE ENGLISH FLEET

With armed merchant vessels and shallow-hulled Dutch flyboats vastly outnumbering the 34 warships in the fleet, the English Navy couldn't match the Spanish invasion force in terms of firepower. Those few English battleships, however, were smaller than their Spanish counterparts, meaning they had fewer guns but also a lower profile and greater speed.

FIRESHIPS

Significantly outgunned, the English launched eight fireships against the Spanish fleet. These were a unique terror to early modern vessels that were made of wood, caulked with tar, and filled with gunpowder. Even the ropes were greased with fat, making the bulk of the ship highly flammable. Fireships were usually steered by a skeleton crew who would abandon ship at the last minute.

would take time to organise. Fortunately for Philip, the Pope permitted him to levy 'crusade taxes', which went a long way to funding the planned invasion. However, neither divine favour nor convenient taxation could prevent Francis Drake's raid on Cadiz in April 1587, which saw 30 ships put out of action and vital supplies seized, pushing the Armada's expedition back by a year.

Further problems occurred in February of the following year when the man chosen to lead the fleet, Álvaro de Bazán, a vastly experienced (and some say undefeated) admiral, died, forcing Philip to elect the Duke of Medina Sidonia, Alonso Pérez de Guzmán, to the position. Aware of his own limitations, de Guzmán immediately appealed against his unexpected elevation in the form of a letter to

the king, but his efforts were foiled when royal advisors intercepted it.

Despite its inauspicious beginning, the Armada finally set sail from Lisbon on 28 May 1588, putting 160 ships, approximately 32,400 men (of which around 21,500 were soldiers) and 2,400 cannons to sea in the process. Such a force seemed destined to splinter all opposition and restore the heathen nation of England to Catholicism, or at the very least put an end to any English support of the United Provinces (seven states in the Netherlands that had succeeded in ousting the Spanish).

Unfortunately, the plan that this vast fleet was due to follow was anything but simple. The ships were ordered to sail for the Spanish Netherlands, where awaiting their arrival stood

an army of 30,000 men under the command of the brilliant Duke of Parma. Under the cover of the Spanish ships, Parma's troops would be conveyed to England (Kent specifically), where they would make land and begin the invasion. Having successfully stunted the Dutch revolt and returned the southern cities (which today are in Belgium) to Spanish control, Parma, an Italian by the name of Alessandro Farnese, would prove a formidable threat to any English hopes of pushing the invaders back into the sea. Then the weather intervened.

As it would throughout the Armada's ultimately doomed expedition, the elements turned against it, forcing some of its number to return to port. Then, on 19 July, any hope of maintaining the element of surprise evaporated when the fleet was spotted off the coast of



Queen Elizabeth I addresses the troops mustered at Tilbury

Cornwall. A series of beacons were immediately lit, sending news to London of the presence of the Spanish. The stage seemed set for a decisive engagement. With the English fleet unable to sail out of Plymouth harbour due to the tide, it was suggested to de Guzmán that the moment had come to strike. Unfortunately for King Philip II's ambitions, de Guzmán prevaricated and then decided not to act, claiming that engaging the English had not been approved by the king. It was a decision both would come to regret.

As the Spanish made for the Isle of Wight, English fortunes rapidly shifted; the fleet under

Lord Howard of Effingham and Francis Drake was now able to escape its containment and pursue the Armada.

As the Sun rose on the morning of 21 July, the English, by now anchored off Plymouth and having seized the advantage of being upwind of their foes (known as gaining the weather gauge), moved to engage the enemy.

Conscious of the fact that the Spanish fleet was trained to unleash its cannons in one furious burst before rushing up to the top deck and preparing to board their stricken victim, the English wisely kept their distance, firing at range while being sure to maximise their speed advantage to keep out of the reach of Spanish grapples. However, while this meant that they didn't lose a single ship during the encounter, it also spared the Spanish, who, arranged in a convex arc formation, withstood the barrage easily, only losing two ships (Rosario and San Salvador) when they collided.

As the smoke of the cannons dissipated Drake found himself consumed by a familiar urge to loot the ailing Spanish ships that had smashed into one another earlier in the day. While doing so would secure both useful information and valuable supplies, it very nearly cost the English fleet, and therefore England as a whole, dearly.

In order to approach his targets Drake required the cover of darkness, so as night fell he extinguished the lantern aboard the *Revenge*. In doing so he instantly plunged the rest of the English fleet into confusion, for they were relying on the light in order to follow his lead and maintain formation. As the captains of the ships scrambled to restore order Drake set about boarding and stripping the Spanish vessels, relieving them of gunpowder and – no doubt his favoured prize – gold. He also gained a strategically vital insight into the interior design of the Spanish galleons, which had extremely compact gun decks laden with

supplies. As a result, the sailors manning the guns had very little room to manoeuvre, and Drake quickly deduced that reloading and re-firing the Spanish cannons must be a tricky and time-consuming endeavour.

The English spent the following day (22 July) catching up to the Spanish, who had made good use of their 24-hour advantage.

However, they couldn't mitigate the speed of the English ships, who managed to catch up with them. The next day the men under Effingham and Drake's command formed up in preparation for battle, and while a minor skirmish achieved nothing, a full-throttle assault soon after saw four separate English squadrons racing towards their Iberian foes, forcing the Spanish back and thereby preventing them from anchoring safely in the Solent to await news of Parma's army.

Reluctant to risk defeat, de Guzmán instead opted to make for the safety of Calais. This seemingly prudent retreat would prove to be a fatal error.

Having reached Calais on 27 July, the Spanish lowered their anchors in anticipation of collecting Parma's force of 30,000 well-equipped troops from Dunkirk. Word soon reached them that quickly disabused them of this notion. Parma's army had been almost halved by disease and was in fact not ready to embark. The Armada's growing problems were compounded by the news that Dunkirk was being blockaded by valiant Dutch flyboats steered by men who knew all too well that the formidable Spanish ships were too large to sail into the shallow waters off the coast of the Netherlands. Parma was now stranded with no hope of rescue, and the blockade was



King Philip II was determined to restore England to Catholicism



Spanish hopes of invading Protestant England were scattered along with its ships

the death knell for any dreams of spiriting his men to England. To say that overlooking this potential impediment was an oversight by King Philip's advisors would be an understatement.

As de Guzmán no doubt prevaricated over what to do next the English were plotting a blazing denouement for his fleet. Understandably nervous of lone ships being preyed on, de Guzmán ordered the Armada to drop anchor off Calais in a tight formation, hoping for safety in numbers. What he hadn't catered for was the English turning this otherwise reasonable decision against the Spanish by exploiting their compact ranks.

With the hour approaching midnight, the silence of the port of Calais was suddenly split by a ripple of panic as the Spanish watched no less than eight fire ships bearing down on them, each one stripped of any unnecessary weight and then crammed to the deck with brimstone, pitch, tar and gunpowder.

Fearing that the looming fire ships were in fact 'hellburners' (ships filled with gunpowder charges), the majority of the Armada hastily cut their lines and sailed away to safety, leaving de Guzmán and the main Spanish warships stranded behind.

While the flaming missiles failed to severely damage any of the Spanish fleet, they did succeed in shattering the previously formidable crescent shape of the Armada. The field had been levelled and the scene was set for a decisive encounter off the Belgian port of Gravelines. England's fate would be decided.

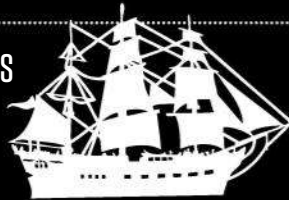
Aware that in order to inflict sufficient damage they would have to close on the enemy to within 100 yards, the English sailed forth and unleashed a torrent of cannon and



HABSBURG SPAIN

NUMBER OF SHIPS

160



NUMBER OF SAILORS

32,400

APPROX.

NUMBER OF CANNON

2,400



ALONSO PÉREZ DE GUZMÁN

Appointed by King Philip II despite his protestations, de Guzmán did his best, but his lack of military experience ultimately proved telling.

- + Reorganised fleet and bolstered its numbers
- Reluctantly took control after stressing his lack of experience

SAN MARTIN

The flagship of the Spanish Armada saved a fellow galleon by fighting off 15 English ships alone for an hour.

- + A beast of the seas armed with 48 guns
- Compact interior made reloading cannons incredibly difficult



SWORD

The Spanish favoured boarding weapons such as the sword as they were trained to fire their cannons once then prepare to leap onto the enemy's vessel.

- + Ideal for close-quarters fighting on a cramped deck
- Useless at Gravelines as the English kept their distance



ENGLAND

APPROX.

NUMBER OF SHIPS

200

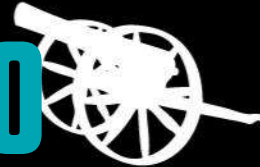


NUMBER OF SAILORS

18,000

NUMBER OF CANNON

3,000



FRANCIS DRAKE

Heralded as a daring national treasure, Sir Francis Drake had 25 years of sailing and battling on the high seas behind him before the Armada set sail on orders from King Philip.

- + Vast experience in waging war at sea
- The promise of fame and fortune could cloud his judgement

THE REVENGE

Led by none other than Sir Francis Drake, this pioneering race-built galleon led the English fleet to victory at Gravelines.

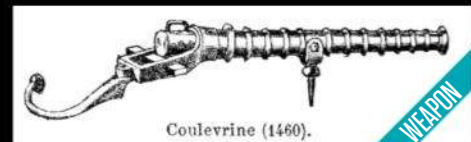
- + Fast, well-armed thanks to 46 guns, and captained by Drake
- Despite being small at 400 tons it cost £4,000 to build, a vast sum at the time



CULVERIN CANNON

Deriving its name from the Latin for 'of the nature of a snake', this versatile gun became an English favourite in the late 16th century.

- + Offered a long, flat trajectory and a high muzzle velocity
- Slow to reload and often so heavy as to be immobile



Culverin (1460).

musket fire. Swathes of Spanish gunners fell in the maelstrom of metal as the broadsides of the Armada's vessels began to splinter, causing a number of ships to list precariously as their sailors scrambled to return fire. After eight hours of fighting five Spanish ships were drifting below the waves and the English were beginning to pull back as their guns ran empty.

The English 'victory' at Gravelines sent the final cannonball into the hull of King Philip II's dreams of conquering England and re-establishing Catholicism, but in truth any threat to the realm of Elizabeth I went up in a cloud of smoke the moment news of Parma's entrapment reached de Guzmán.

Elizabeth's famous address at Tilbury sounds somewhat less dramatic when one considers that by the time she gave it, inspiring as it was, the danger had long since passed.

Having prevaricated when decisiveness was required, having held back when a final push could have established a vital foothold, de Guzmán was guilty of many failings, but the doom of the Armada does not rest squarely upon his shoulders. From its conception the plan was destined to flounder, sunk by poor planning and the impetuous whims of a ruler bent on reminding an irritating neighbour of his far-reaching powers.

Having sailed for Scotland following its mauling off Gravelines, the Armada was almost completely obliterated by storms as it made for home. Upon hearing that less than 10,000 of his men had made it home, and many of them ill or dying, an enraged King Philip is said to have lambasted the interference of "God's winds and waves."

In the years that followed the reigning naval power of Spain was gradually cancelled out by the emerging seaborne prowess of the English, with both sides sending fleets to harass the other before the inevitability of a peace pact finally became clear to both, culminating in the Treaty of London in 1604. By then King Philip had been dead six years, his hopes of putting an end to England's infernal interference in his internal affairs well and truly dashed.

In the centuries to come Spain's dominance on the global stage would begin to wane, while the influence of England would see it establish an empire beyond compare. How different the history of the world would have been had de Guzmán managed to land upon England's shores and unleash the full might of the Duke of Parma's hordes.

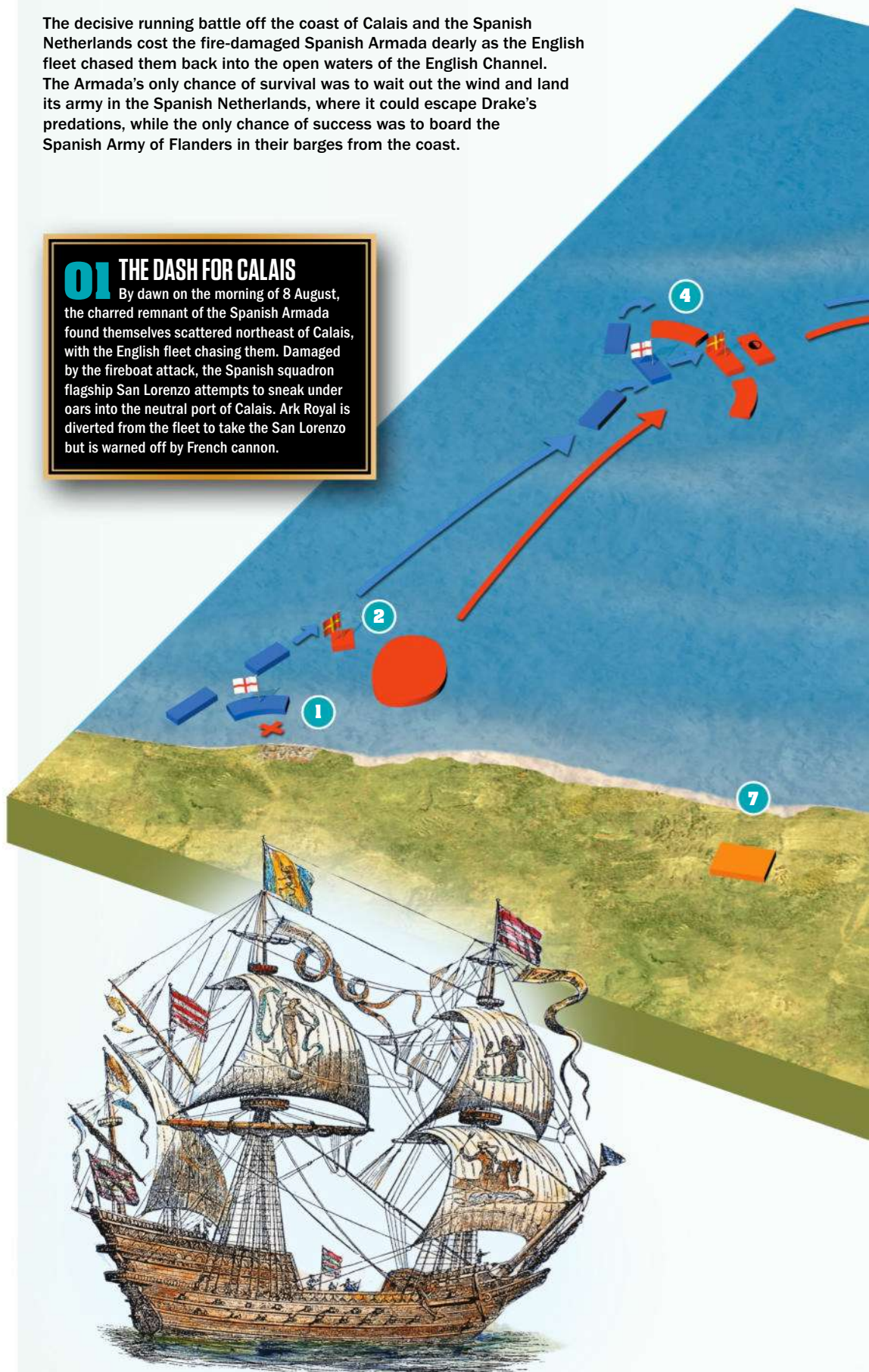
"THE ENGLISH 'VICTORY' AT GRAVELINES SENT THE FINAL CANNONBALL INTO THE HULL OF KING PHILIP'S DREAMS OF CONQUERING ENGLAND AND RE-ESTABLISHING CATHOLICISM"

8 AUGUST 1588

The decisive running battle off the coast of Calais and the Spanish Netherlands cost the fire-damaged Spanish Armada dearly as the English fleet chased them back into the open waters of the English Channel. The Armada's only chance of survival was to wait out the wind and land its army in the Spanish Netherlands, where it could escape Drake's predations, while the only chance of success was to board the Spanish Army of Flanders in their barges from the coast.

01 THE DASH FOR CALAIS

By dawn on the morning of 8 August, the charred remnant of the Spanish Armada found themselves scattered northeast of Calais, with the English fleet chasing them. Damaged by the fireboat attack, the Spanish squadron flagship San Lorenzo attempts to sneak under oars into the neutral port of Calais. Ark Royal is diverted from the fleet to take the San Lorenzo but is warned off by French cannon.



02 THE DUKE PLAYS FOR TIME

San Martin, the Duke of Medina Sidonia's flagship, and four other galleons place themselves between the English and the bruised Armada. Over two hours the brave Spaniards fight a delaying action against the English, giving the Armada time to reform. Despite overwhelming odds, the five Spanish warships make it back to the Armada and take their places in the formation.

"UNFORTUNATELY FOR KING PHILIP II'S AMBITIONS, DE GUZMÁN PREVARICATED AND THEN DECIDED NOT TO ACT"

03 HIDDEN DANGERS

The Armada are unable to dash straight for the coast of the Spanish Netherlands and the waiting Spanish Army of Flanders as Dutch rebels have removed the sea marks. These navigation aids revealed the presence of the Shoals of Flanders, submerged sand banks that had to be taken with caution lest vessels run aground.

04 THE BATTLE IS JOINED

The English, now reinforced by the ships harrying the San Lorenzo at Calais, launch an attack on the right flank of the Spanish Armada, which had formed a crescent with its supply ships protected at the rear. The lighter English ships are easily able to flank their slower Spanish counterparts and get close enough to unleash musket and cannon fire. Keeping the wind at their backs, the English position themselves so that the Spanish hulls are raised towards them, exposing the vulnerable hull below the waterline.

05 THE BATTLE FLOURISHES

Still in formation, the Spanish Armada is heavily battle damaged and by the afternoon the English are starting to run out of ammunition, with some gunners loading chain and other debris into the guns to keep the pressure on. After eight hours of fighting the English pull away and the Spanish use the breathing space to begin repairs, but as the wind rises their opportunity to make for the Spanish Netherlands departs on the breeze.

06 THE SPANISH ESCAPE

With the Spanish right flank and rear badly damaged, the formation begins to collapse. Medina Sidonia leads another delaying action to cover the Spanish retreat as the Armada is driven out into the North Sea.

07 CAST AWAY

The Duke of Parma's Spanish Army of Flanders – a multinational force chiefly concerned with suppressing Dutch revolts – never joins the Spanish Armada and never poses a serious threat to the Kingdom of England.

08 SHALLOW WATER PIRATES

Allied to England, shallow-hulled flyboats commanded by the rebel Dutch waited in the sandbanks. Able to traverse the dangerous waters around the coast, they were poised to harry the Spanish Army of Flanders if its barges set out to join the Armada.

Great Battles

BATTLE OF
LEPANTOLEPANTO, GULF OF PATRAS,
IONIAN SEA, 7 OCTOBER 1571

WORDS MICHAEL HASKEW

The galley, a design of ship dating back to antiquity, and the expansion of the Ottoman Empire into the Mediterranean Sea, both met their end at the Battle of Lepanto. The Ottoman invasion of Cyprus in 1570 resulted in the occupation of the island and the slaughter of the defenders of Famagusta, the final Venetian stronghold. The Ottoman Empire, ruled by Sultan Selim II, threatened further westward encroachment. Pope Pius V formed the Holy League to turn back an assault on European Christendom.

Poised to strike westward, the Ottoman fleet and its commander Ali Monizindade Pasha anchored at Lepanto, 230 galleys and 70 faster galiots strong. The Holy League fleet

assembled at the Sicilian port of Messina under Don Juan of Austria, the 25-year-old half-brother of King Philip II of Spain, an armada that included 206 galleys and six heavy galleasses mounting more than 40 cannon each. The Republic of Venice supplied the galleasses and 105 galleys, while the Kingdoms of Naples and Sicily – part of the Spanish Empire – contributed 49, and the Republic of Genoa 27. The Papal States, Grand Duchies of Tuscany and Savoy, and Knights Hospitaller contributed smaller numbers.

The Holy League fleet sailed in mid-September with nearly 29,000 soldiers and 40,000 oarsmen and sailors. Among the Holy League troops were fine Spanish infantrymen,

DON JUAN'S FLAGSHIP

The flagship of Admiral Don Juan of Austria, commander of the Holy League fleet, is called Real. It flies the double eagle standard of the Habsburg Empire and the banner of Christ on the cross as it manoeuvres to engage Sultana, the flagship of Ottoman commander Ali Monizindade Pasha.

NEGRONI FAMILY GALLEY

Emblazoned with the white and red Maltese Crosses of the city-state of Genoa, the galley of the Negroni family is heavily engaged with Ottoman galleys. Arquebusiers exchange gunfire from exposed positions while oarsmen work to maintain mobility in the close-quarter battle.

whose expertise with the arquebus, an early firearm, would provide a distinct advantage in the coming battle. For his part, Ali Pasha had mustered over 31,000 soldiers and 50,000 sailors and oarsmen for the Ottoman fleet, many of them Christian slaves.

When the fleets came in sight of one another both commanders hastened to engage. Don Juan worried that prevailing winds would prohibit the formation of a battle line; however, at the critical moment the winds shifted. His warships took stations, those to the left under Venetian commander Agostino Barbarigo, those on the right under Gianandrea Doria of Genoa, and the ships in the centre under Don Juan, with Sebastiano Venier of Venice and

Marcantonio Colonna of Rome in support. Don Alvaro de Bazan, Spanish Marquis of Santa Cruz, commanded the reserve.

As the Ottoman galleys approached, the heavy cannon of the Venetian galleasses lashed the enemy. On the Ottoman right, Mehmed Sirocco's swift galiots sliced between Barbarigo's galleys. The Venetian commander turned sharply, trapping the enemy against the north shoreline of the Gulf of Patras. A wild melee ensued as galleys pulled alongside galleys, troops trading arquebus fire and clouds of arrows. Barbarigo held the line but died with an arrow penetrating his eye. Sirocco also fell.

In the centre, the opposing flagships locked in combat, as the Spanish infantry fought the

Ottoman Janissaries. Don Juan suffered a leg wound, and a lead ball through the head killed Ali Pasha. Their commander's death panicked the Turks in the centre. On the Holy League right, the critical moment was reached as Uluch Ali led Turkish galleys through a gap near Doria's position. The Holy League reserve raced to the rescue. Don Alvaro contained the enemy flanking manoeuvre and supported Gianandrea Doria.

With its last bid for victory thwarted, the Ottoman fleet disintegrated. Only Uluch Ali's command survived with few losses. Over 130 Ottoman vessels were taken and 50 sunk. The Turks lost 30,000 men. Holy League losses, however, totalled 7,500 dead.

ALI PASHA'S FLAGSHIP

Sultana, the Ottoman flagship under Ali Monizindade Pasha, flies an Islamic standard with three crescents off the starboard quarter of Admiral Don Juan's Real. It appears to be fighting a smaller galley of the Holy League Fleet. The figure of a commander, perhaps Ali Pasha himself, is visible gesturing at the stern of the galley.

DELIVERING HEAVY PUNISHMENT

In this 16th-century painting by an unknown artist, a Venetian galleass of the Holy League batters a light Ottoman galiot with cannon fire. The Ottoman fleet at Lepanto included 70 galiots, also known as half-galleys, mounting up to ten cannon of light calibre with 16 pairs of oarsmen.

A DEADLY FLAME

An Ottoman galley burns furiously and sailors abandon the stricken vessel as the galley of Murat Reis, an Albanian-born Ottoman commander whose actual presence at Lepanto is not confirmed, sails close by while flying a gold and white battle flag with a single crescent adorning its centre panel.

A TRAITOR'S WARSHIP

Christian turncoat Uluch Ali, his galley in the foreground, attempts to flee from the scene of battle. Ali has mounted an attack against the centre of the Holy League line, captured a number of Christian galleys, and slaughtered everyone aboard. However, the arrival of enemy reinforcements compels him to retire.

DREADNOUGHT OF ITS DAY

Its sail billowing, a massive Holy League galleass (one of six supplied by the Venetian city-state) flies the Lion of Venice standard and delivers a broadside. The galleass was heavier than the galleys deployed at Lepanto, bringing great firepower to bear, although it depended on the winds to maintain position.

HOLY LEAGUE FLEET

TROOPS 29,000

SAILORS 40,000

CANNONS 1,800

WARSHIPS 212



LEADER

DON JUAN OF AUSTRIA

Don Juan was a proven military commander on land, experienced beyond his years by Lepanto.

STRENGTHS Don Juan maintained a tenuous coalition and unity of command.

WEAKNESS Although a veteran warrior, Don Juan lacked naval combat experience.



KEY UNIT

HOLY LEAGUE INFANTRYMEN

The infantrymen aboard the Holy League vessels at Lepanto performed admirably, particularly the elite Spanish arquebusiers aboard Don Juan's flagship.

STRENGTHS Holy League infantry demonstrated expertise with the muzzleloading arquebus firearm.

WEAKNESS On unstable shipboard platforms, infantrymen were vulnerable to Ottoman archers.



KEY WEAPON

ARQUEBUS

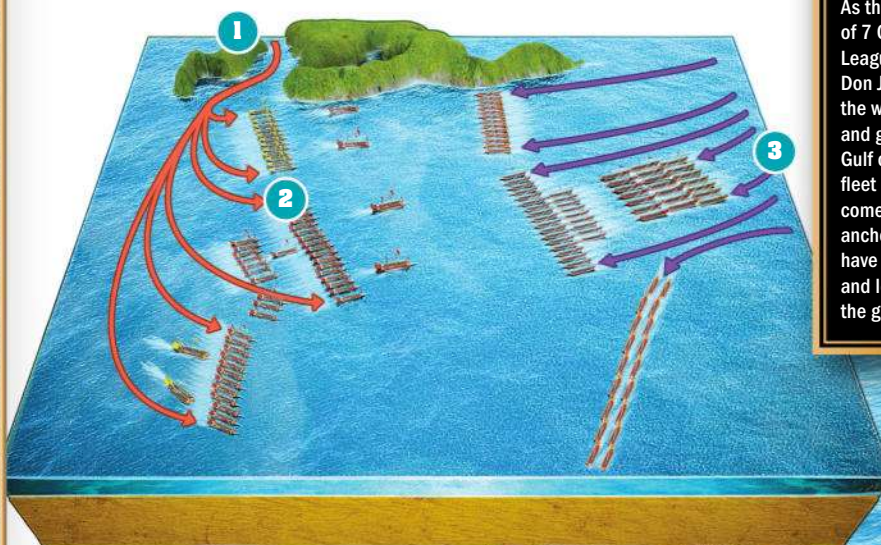
The arquebus was an early muzzleloading smoothbore matchlock firearm.

STRENGTHS The arquebus offered firepower, sometimes concentrated, against somewhat distant enemies.

WEAKNESS The arquebus was cumbersome to operate, particularly at close range.

01 DAWN OF BATTLE

As the Sun rises on the morning of 7 October 1571, the Holy League fleet under 25-year-old Don Juan of Austria sails along the western coastline of Greece and glides eastward toward the Gulf of Patras. Soon, the vast fleet of the Ottoman Empire comes into view, sailing from its anchorage at Lepanto. Priests have provided ritual absolution and led rosary prayers aboard the galleys of the Holy League.



02 DEPLOYING FOR THE ENGAGEMENT

Don Juan of Austria, illegitimate son of Holy Roman Emperor Charles V and half-brother of Spanish King Philip II, pushes his heavily armed galleasses forward to disrupt the Ottoman vanguard. Don Juan recalls the words of Pope Pius V: "The Turks, swollen by their victories, will wish to take on our fleet... God will give us victory. Charles V gave you life. I will give you honour and greatness. Go, seek them out!"

03 WIND FROM THE EAST

Ali Monizindade Pasha, commanding the Ottoman Turkish fleet, arranges his warships in a great crescent formation, but the wind shifts in favour of the Holy League fleet. Compelled to drop their sails, the Turks exhort their oarsmen to pull against the wind as they approach the enemy. Although his galleys outnumber the Holy League, Ali Pasha is significantly outgunned. His galleys mount fewer than 800 cannon, while the Christian array have more than 1,800.

04 BATTLE COMMENCES

Around noon, the opposing fleets collide. In the centre, the cannon of Venetian galleasses, deployed forward of the main Holy League dispositions, sink at least two Turkish galleys. On the advice of Gianandrea Doria, Don Juan has ordered all bow spars removed from Holy League galleys. These would be used to ram enemy vessels. Their removal allows Holy League cannon to depress lower, inflicting damage on enemy galleys below the waterline.



10 THE GALLEY'S LAST HURRAH

Ushering in the age of sail, the last major naval battle between galleys and one of the largest naval battles in history ends as remnants of the Ottoman fleet withdraw.

09 TIMELY ARRIVAL OF DON ALVARO

The Holy League reserve, comprising 35 galleys under Spain's Don Alvaro de Bazan, holds off Uluch Ali's flanking assault on the centre and then bolsters Doria to blunt the Ottoman threat.

KEY

-  Ottoman Fleet
-  Holy League Fleet

08 ALI'S DESPERATE RUSH

As the fighting intensifies and Don Juan is drawn into combat, Gianandrea Doria struggles to maintain contact with the centre of the Holy League line. A widening gap invites Uluch Ali to charge into the breach in an attempt to outflank the Holy League centre and cut off Doria's right wing.

07 DEATHS OF THE DUELLERS

Agostino Barbarigo of Venice encourages his men to maintain their line; he learns that Mehmed Sirocco has been killed in the battle but dies a short while later with an Ottoman arrow lodged in his eye. Inspired by their leader's bold sacrifice, the Venetians prevail. The enemy attack is shattered.

06 CORSAIRS VERSUS VENETIANS

Swift Ottoman galiots sweep between the galleys under the command of Agostino Barbarigo on the left flank of the Holy League fleet. Followed by galleys under Mehmed Sirocco, they disrupt the defences. However, Barbarigo skillfully turns into the threat, trapping numerous Turkish vessels against the Greek shoreline, where they are destroyed in detail.

05 DON JUAN VERSUS ALI PASHA

The flagships of Don Juan and Ali Pasha become hotly engaged. Ali's Sultana rams Don Juan's Real. Spanish infantrymen, or arquebusiers, pour deadly fire into the elite Ottoman Janissaries. Spanish troops board Sultana twice but are thrown back in hand-to-hand fighting. Fired from an arquebus, a lead ball kills Ali Pasha, whose head is severed from his lifeless body and placed on a pike. Terrified, the Turks in the vicinity panic.

OTTOMAN TURKISH FLEET

TROOPS 31,000
SAILORS 50,000
CANNONS 750
WARSHIPS 250



LEADER ALI MONIZINDE PASHA

Killed at the Battle of Lepanto, Ali Pasha also lost the 'Grand banner of the Caliphs', a treasured Islamic flag.

STRENGTHS Bold and daring, Ali Pasha was confident, inspiring his forces.

WEAKNESS Impetuous and a poor tactician, he allowed his forces to lose their cohesion at Lepanto.



KEY UNIT JANISSARIES

Elite infantrymen of the Ottoman Empire, the Janissaries were originally formed as the sultan's bodyguard or household troops.

STRENGTHS Willing to forfeit their lives, Janissaries were particularly effective shock troops.

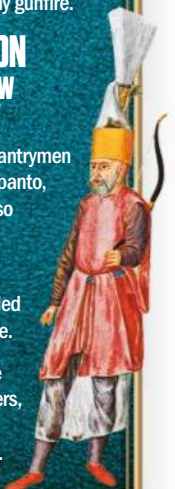
WEAKNESS Early Janissaries were expert archers but were also vulnerable to enemy gunfire.

KEY WEAPON OTTOMAN BOW AND ARROW

Although Ottoman infantrymen carried firearms at Lepanto, many archers were also present at the battle.

STRENGTHS The sturdy composite bow provided an excellent rate of fire.

WEAKNESS Lacking the lethality of arquebusiers, the archers were susceptible to gunfire.



MAN-OF-WAR

HIGHLY VERSATILE AND POWERFUL SHIPS CAPABLE OF TRADE, DIPLOMACY AND COMBAT, THE MAN-OF-WAR WAS THE MOST PROMINENT OF ARMED SHIPS FROM THE 16TH TO 19TH CENTURY

Spanning a variety of ship designs from the 1500s to 1850, but typified by the galleon and ship of the line class of vessels, man-of-war ships were exemplars of shipbuilding expertise, delivering high manoeuvrability, storage capacity and firepower. They worked by taking the roundship and cog ship designs that had been the staple for European trade, transport and warfare since medieval times – both were powered by oars instead of sails – and added multiple masts, decks and cannons as well as more advanced rudder systems. These additions meant that long-scale voyages were now possible, opening up the largely uncharted world to nations and merchants looking to exploit the Earth's natural resources – opportunities that ultimately led to the great Age of Discovery.

One of the most notable man-of-war ship designs was that devised by Sir John Hawkins, treasurer and controller of the British Royal Navy for Elizabeth I, and a key player in defeating the Spanish Armada in 1588. Hawkins' man-of-war – a name chosen by Henry VIII – was adapted from the Spanish galleon

and Portuguese carrack and had three masts, was 60 metres long and sported a maximum of 124 cannons, four at the front, eight at the back and 56 on each side. Powered by sail and with a high (for the time) top speed of nine knots (17 kilometres per hour), Hawkins' man-of-war proved to be incredibly successful through the 17th and 18th centuries. It was chosen and adapted by Sir Francis Drake on numerous expeditions.

The last man-of-war ships to be designed were the Grade-1 listed ships of the line in the late 18th and 19th centuries. These were

colossal warships designed to be used in line of battle warfare, a naval tactic where two columns of opposing ships would try to out-maneuvre each other to bring their largest cannons into range of the enemy. They were built primarily for combat and, as demonstrated on Lord Nelson's flagship HMS Victory – which sported a massive array of 32, 24 and 12-pounder cannons – were well armed.

For these first-rate ships of the line, trade was merely an afterthought, coming behind transport, diplomacy and combat in both functionally and priority.

“POWERED BY SAIL, HAWKIN'S MAN-OF-WAR PROVED TO BE SUCCESSFUL THROUGH THE 17TH AND 18TH CENTURIES”



HMS Victory: one of the finest man-of-war examples



INSIDE THE MAN-OF-WAR

WHAT MADE THIS SHIP DESIGN SO DOMINANT FOR SO LONG?

QUARTERDECK

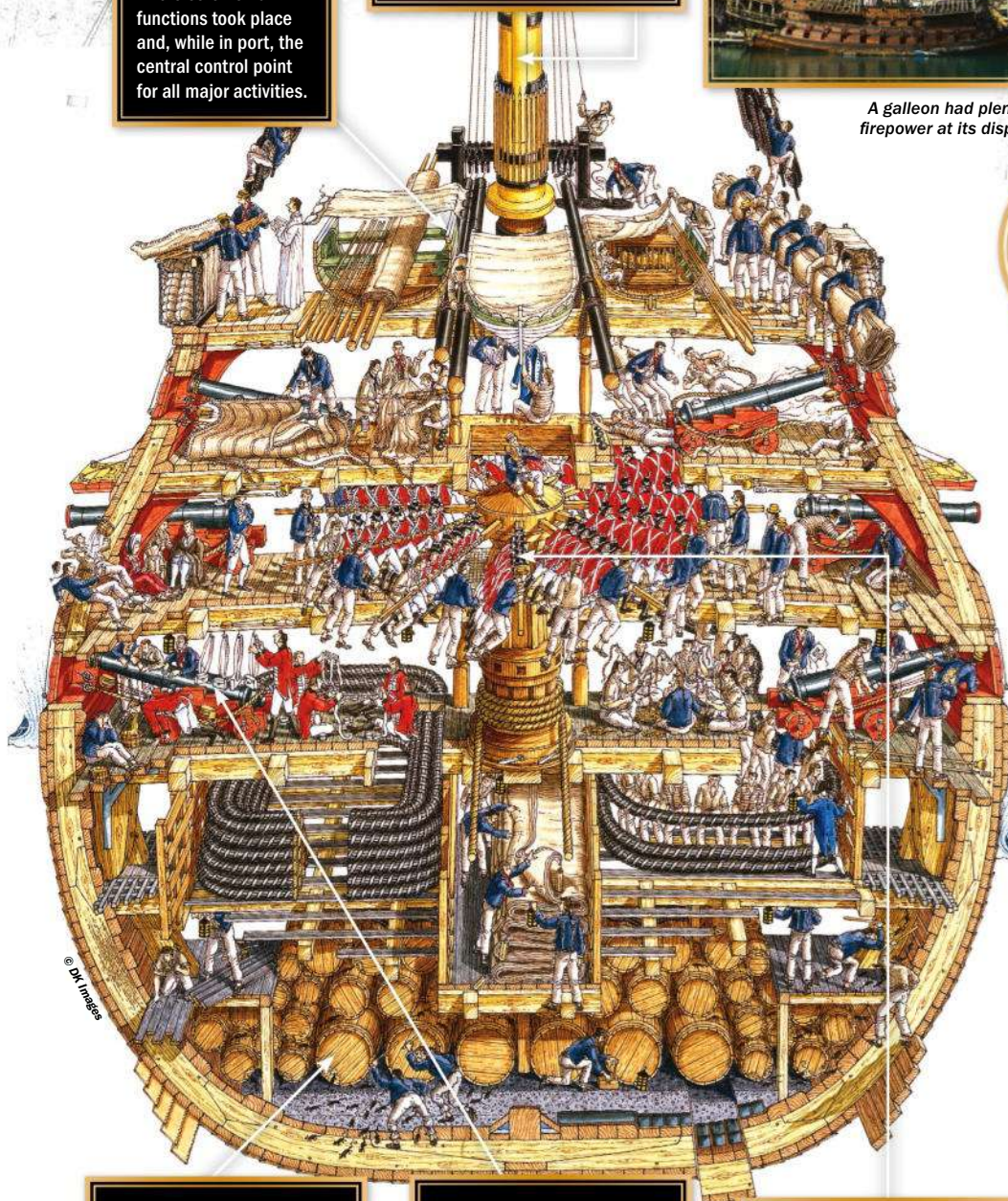
The quarterdeck was the area of the ship where ceremonial functions took place and, while in port, the central control point for all major activities.

MASTS

Common to man-of-war ships was a two- to four-mast design. These included the rear mizzen mast, central main mast and forward foremast. Not all man-of-war ships were square rigged, however.



A galleon had plenty of firepower at its disposal



© DK Images

CARGO

Early man-of-war ships were primarily used for exploration and trading even though they were armed. Their cargo was diverse due to the exotic locations they visited and included foodstuffs, precious metals and slaves.

CANNONS

While various types of cannons were used on man-of-war ships, 2,540kg demi-cannons were popular thanks to their 490m range and 6in (15cm) calibre. Demi-culverins and sakers were also installed in various quantities.

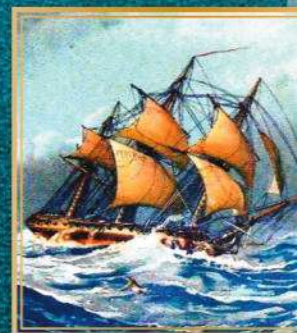
ANCHOR

Due to the large size of the ships used – with much room needed for their extensive cargo, cannons and crew members – the size of the anchor was also massive, requiring many men to winch it up from the ocean floor.

MAN-OF-WAR EVOLUTION

15TH–16TH CENTURY (CARAVEL)

A small, highly manoeuvrable sailing ship developed in the 15th century by the Portuguese, the caravel was the predominant exploration and trading vessel at the time operating in Europe and Africa. It was also used in naval warfare.



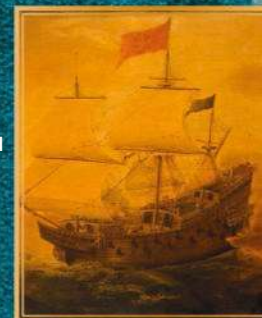
15TH–16TH CENTURY (CARRACK)

A three- or four-masted ship used in Europe, the carrack is considered the forerunner of the great ships of the age of sail. Slightly larger than the caravel, it could undertake longer trading journeys. It was armed with few cannons.



16TH–18TH CENTURY (GALLEON)

Used for both trade and warfare, the galleon evolved from the carrack and included a lowered forecastle and elongated hull for improved stability and manoeuvrability. It had multiple cannons on multiple decks and became a major fighting ship.



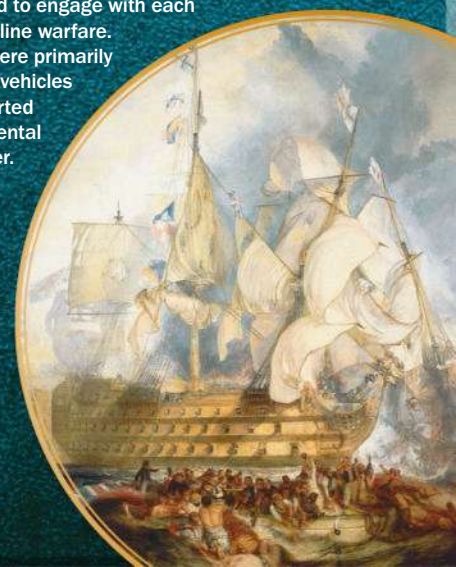
17TH–19TH CENTURY (FRIGATE)

Smaller than galleons, frigates were similar to ships of the line but were faster and lightly armed. They were often used for patrolling and escort missions as well as protecting trade ships and trade routes with their cannons and crew.



17TH–19TH CENTURY (SHIP OF THE LINE)

The largest ships built in the great age of sail were ships of the line, massive warships designed to engage with each other in line warfare. These were primarily combat vehicles and sported monumental firepower.



ADMIRAL YI SUN-SIN

THE KOREAN MILITARY GENIUS WHO OVERCAME OVERWHELMING
ODDS TO GRIND JAPAN'S SAMURAI WAR MACHINE TO A HALT

WORDS HARETH AL BUSTANI

Born in Seoul in April 1545, Korean lord Yi Sun-sin wasn't your typical aristocrat. While most well-heeled youth in Joseon-era Korea shared a Confucian disdain for martial arts, Yi hurled himself into the traditional pursuits of archery, horseback riding and swordsmanship. As his wealthy peers searched for ways to evade military service, Yi served with pride. In an exam in 1576, he was thrown from his horse so violently he broke a leg. Undeterred, he fashioned a splint from a willow branch and dragged himself back onto his horse to complete the test.

After graduating, he was made a navy commander on the southern tip of the Korean Peninsula. However, he soon learned a bitter lesson about the petty intrigues that plagued the Joseon military. When Yi dared to speak out against institutional corruption, his furious superiors stripped him of his title and forced him to take command of the fortress of Konwon, a dangerous position on the northern frontiers where they hoped he might be killed. The fortress was attacked soon after by a Jurchen raiding army, but Yi set an ingenious trap that led to the capture and execution of the enemy chief. However, just as his star began to rise, his father suddenly died, requiring him to withdraw from service to mourn.

When Yi re-enlisted, he once again found himself on the receiving end of an invasion from Manchuria. During this assault he took an arrow to the leg but quietly ripped it out and pressed on, lest any of his juniors lose morale. This brave display only further embittered his senior rivals, who had him arrested for 'desertion'. When Yi refused to confess, even under torture, he was stripped of his rank and imprisoned. It took a direct intervention from King Seonjo to free him, under the condition that he would serve as a common soldier – he accepted with such humility that the king pardoned him.

Following this, Seonjo took a direct interest in his career, but his increasingly envious enemies continued to intervene, having him

Despite perfecting the turtle ship, Yi's greatest asset was his genius



이순신의한산대첩 Admiral Yi Sun-sin's Great Victory at Hansan

rotated across various posts until Yi landed at Cholla Left Naval Station at the seaport of Yosu. Ordinarily, this job was to keep pirates at bay. However, there was a more pressing threat from the most unlikely of places. Having completed the decades-long unification of Japan, fuelled by success and limitless ambition, Japan's warlord Hideyoshi set his sights on the impossible: he would conquer China. But first he needed to cross the Strait of Tsushima and establish a landing point on the Korean Peninsula. With typical haughty bravado, he wrote to the Korean king demanding he help save his country's "soul" and "help clear my way". However, as a virtual vassal of the pre-eminent Ming China, siding with Hideyoshi was simply not an option for Korea.

Enraged, Hideyoshi launched an almighty assault, sending 160,000 warriors under the

leadership of the Christian lord Konishi Yukinaga and the fearless Buddhist Kato Kiyomasa. The Koreans were utterly overwhelmed by the Japanese combination of arquebusiers, archers and swordsmen, who stormed all the way from Seoul to Pyongyang in a matter of months. It was a war unlike any Korea had ever seen, with the Japanese killing and destroying on an unprecedented scale.

Samurai had always taken great pride in wrenching the heads off their victims and counting them. However, in Korea they massacred so many they had to swap to cutting off their ears, 38,000 of which were later buried in Kyoto. 90 per cent of Koreans were left homeless and agriculture was decimated, triggering nationwide famines. Amid societal collapse, Korea's hopes fell at the feet of a single man, the ever-industrious Admiral Yi.

*Never willing to show
weakness, Yi made
a habit of hiding
his injuries, lest he
demoralise his juniors*



Fortunately, Yi had already been hard at work. With a rather unsophisticated naval tradition, he recognised that the Japanese instead loaded huge numbers of men onto broad-beamed ships, from which they rained arrows and bullets upon the enemy until finally sending in the swordsmen to board and finish them off. The mightiest Japanese ships, the Atakebune, were clad in iron, which made them sluggish and best suited for coastal operations. Korea had already begun experimenting with a cannon-armed Geobukseon, or 'turtle ship', but by the time of Yi's appointment the Korean navy was woefully incapable of taking on its Japanese counterpart. Yi wasted no time in closing the gap. Drawing on local boat yards, within months he developed a ship advanced enough to seize control of the peninsula's several sea approaches, severing Japan's supply and communication lines. With exceptional protection, mounted cannons and

high speed, they gave Yi enough versatility to bring the fight to Japan.

The only problem was that he had less than a dozen of them to work with. If he stood any chance of making a dent in Japan's armada, he would have to rely on another asset: his own genius. A master strategist, he anticipated that the Japanese would respond to his cannon-mounted ships by producing their own. Always a step ahead, he devised a tactic called 'holding onto each other's tails', where his ships would bring their guns to bear on the same targets as they passed them in turn, unleashing an apocalyptic stream of continuous cannon fire. Another of his innovations, 'drawing the fish into the net', saw his ships feign a retreat to draw the entire enemy fleet into their line of attack. When he found himself unable to set battles on his own terms, he spewed out sulphur and saltpetre fumes, blinding the Japanese sailors

so he could get closer. To prepare for these close-quarter encounters he hid his oarsmen and gun crews in thick, iron-bound wooden deck planking, rendered virtually impenetrable. He also used the curved uppermost deck as roof protection and trained his crew to ram their spears through slots in the decking, hidden behind thatch and smoke.

Using these innovations, Yi made an immediate impact, swooping around to the southeastern coast to rescue Admiral Won Gyun's decimated fleet. Remarkably, rather than gratitude, the jealous Won Gyun responded with what Yi described as "an evil heart full of knavish tricks". While Won schemed at court, Yi pressed on, defeating Japan in a series of increasingly decisive naval victories. In one incident, mirroring his fall from the horse, despite being wounded, Yi kept it hidden from his men, lest they be demoralised.

THE KOREAN NELSON

After his death, Yi was named 'Lord of Loyalty and Chivalry' and celebrated for his continuous display of "the three essentials of the warrior: humility, discernment and courage". Undeclared in battle, his remarkable naval accomplishments changed the face of East Asia forever. He has since been immortalised as a rare symbol of integrity and sacrifice at a time of widespread corruption, scheming and selfishness, typical of Joseon-era politics.

Yi has also been revered outside of the Korean Peninsula. Following his stunning, historic victory against the Russian Baltic Fleet in Tsushima in 1905, the Japanese Admiral Togo Heihachiro remarked, "You may wish to compare me with Lord Nelson, but do not compare me with Korea's Admiral Yi Sun-sin. Next to him, I am only a petty officer."

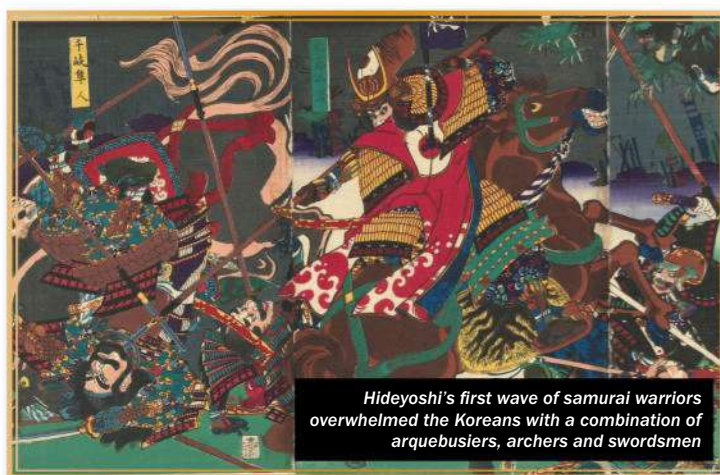
Meanwhile, in 1921, British Admiral George Alexander Ballard did compare Yi to Lord Nelson, remarking that while "it is always difficult for Englishmen to admit that Nelson ever had an equal in his profession," Yi was the only one in the running. "His whole career might be summarised by Yi Sun-sin's remark that, although he had no lessons from history to serve as a guide, he waged war on the sea as it should be waged if it is to produce definite results, and [he] ended by making the supreme sacrifice of a defender of his country."



Admiral Yi is celebrated in both Koreas to this day for his humility, brilliance and courage

Fast, well-armoured and armed with cannons, Yi's turtle ships were instrumental in decimating Japan's supply and communication lines





© Alamy

At the Battle of Hansando in 1592, Yi's nephew recounted how his uncle feigned a retreat, drawing the Japanese from the shallow narrows where they held an advantage and "out to the open sea". As the Japanese gave chase, Yi suddenly waved his flag, roaring for a counterattack. With that, his ships swooped back around in a Crane Wing formation, launching a shocking barrage of cannon balls and burning arrows and destroying 73 ships. Yi's victory was so decisive it utterly decimated the Japanese supply and communication lines. With their ground forces facing increasing resistance from Korean guerrilla soldiers and a belated Chinese counterattack, the Japanese had been driven into a stalemate.

Despite being promoted to supreme naval commander, Yi was frustrated with the Chinese-led peace negotiations with the Japanese, who he didn't trust. When told by a Chinese general to withdraw from a Japanese camp, he yelled, "I am a subject of Korea, and for justice's sake I cannot live with these robbers under the same

heaven." This outspoken manner allowed the bitter Won Gyun to orchestrate yet another plot against him. In a callous test of his 'loyalty', Yi was ordered to take part in a mission that was doomed to fail. Unwilling to risk his men's lives for a political game, Yi was hauled back to Seoul in a cage, forced once again to serve as an ordinary soldier while Won Gyun stole away with his position.

After a brief lull in hostilities, Hideyoshi returned in 1597 with another 140,000 men aboard 1,000 ships. Won Gyun was annihilated in humiliating fashion – a shameful farce punctuated by his desperate attempt to flee – before being captured and decapitated. Realising how much they desperately needed Yi's brilliance, the court appealed to him to save the day, against all odds. With just 12 ships and 120 sailors left, the king considered abolishing the navy, but Yi decried, "I still have 12 ships! As long as I live, [our] enemies will never look down on us." Yi launched another steady stream of ingenious attacks, undermining the

Japanese war machine and even losing one of his own sons in the process. At the Battle of Myeongnyang, he defeated a Japanese fleet of over 130 ships with just 12 of his own.

In late 1598, after Hideyoshi's sudden death, Japan frantically began withdrawing its soldiers. Sensing an opportunity to deal a critical blow, Yi convinced the reluctant Ming Admiral Chen Lin to help him attack 500 Japanese ships as they attempted to withdraw by sea. In the ensuing encounter at Noryang, Yi and Chen Lin destroyed hundreds of enemy ships. However, during the battle's climax, Yi was struck by a stray bullet. With his last breaths, he urged his eldest son Hoe, "The battle is at its height; do not announce my death." His body was hidden in his cabin, and his cousin banged the war drums and waved the flags, ensuring that the men wouldn't mourn until the day was done. Yi's death, ironically, would be among the last of the war. Through his efforts, Japan's conquest was brought to a close, though the samurai prepared to turn their swords on one another once again.

Great Battles

NELSON AND THE
BATTLE OF TRAFALGAR

FOR BRITAIN, TRAFALGAR OFFERED ONE LAST CHANCE TO PREVENT AN INVASION.
FOR NELSON, IT WAS THE FINAL BATTLE AGAINST A FAR MORE FEARSOME FOE

WORDS FRANCES WHITE

Just before noon on 21 October 1805, Admiral Viscount Horatio Nelson stood aboard the deck of his flagship HMS Victory. A light westerly wind whistled through the air, and in the distance he could see the frigates of the Franco-Spanish fleet. For weeks he had bided his time, patiently waiting, reviewing tactics and planning every action down to the finest detail. Now, finally, the hour had come, and he signalled for his fleet to begin the attack. In less than five hours, he would experience a victory that would define his life, and a loss that would end it.

Today, Nelson is remembered as one of Britain's greatest heroes – a warrior, a commander and a victor. However, when he entered this world on 29 September 1758, the sixth of 11 children, he was a sickly baby. His parents were so fearful that he would not survive that they had him baptised early. This occurrence would begin a lifelong tradition of battling and succeeding against the odds.

The Nelson family were not unknown, but they certainly weren't particularly wealthy and they had to exploit their connections to ensure a steady future for their children. Nelson's mother, Catherine Suckling, was a distant relative of Robert Walpole, first prime minister of Great Britain. However, tragically, Nelson's mother died when the boy was just nine. It was to be his maternal uncle who would have the biggest influence on his life, as aged just 12, Nelson began his naval career serving under his uncle, Captain Maurice Suckling, on the HMS Raisonnable.

When Nelson joined the navy, it was in the lowest ranks. However, perhaps the result of being a sixth child in a large family, he sought glory above all else. This quest to make a name for himself and achieve renown fuelled a work ethic that soon impressed his superiors and

saw him ascend through the ranks at a rapid rate. This was particularly impressive for a boy who suffered from extreme seasickness.

After crossing the Atlantic several times, Nelson, eager to experience as much as possible, obtained a position on HMS Carcass. The ship was set on an expedition across the Arctic to find the fabled northwest passage to India. This was a very perilous mission and was ultimately unsuccessful, with the ship forced to turn back. However, along the way an eager 15-year-old Nelson decided to pursue a polar bear across the ice. Young, intrepid and fearless, thanks to a sudden crack in the ice separating the beast from Nelson, the headstrong boy was granted another last minute escape from likely death.

The passionate young sailor saw his first action when he was stationed aboard Seahorse in the East Indies. It was only a brief exchange of volleys, but Nelson was gaining experience and watching carefully. He was a fast learner and had a quick mind for naval tactics, so when a case of malaria caused him to be discharged, it affected him badly. While recovering, Nelson faced another battle but this time with depression. For someone so determined to prove their worth and make a name for themselves, coming so close to a death of relative obscurity was a difficult pill to swallow. However, his proud, optimistic spirit won through, and fuelled by patriotism and renewed determination, Nelson passed the lieutenant exam and set sail again, this time into the perilous heart of the ferocious War of American Independence.

Aged just 20, Nelson was given command of a frigate and experienced his first taste of leading a vessel into battle by attacking Spanish settlements in Nicaragua. The operation was a success, and Nelson was

**"FOR WEEKS NELSON HAD
BIDED HIS TIME, PATIENTLY
WAITING, REVIEWING TACTICS
AND PLANNING EVERY
ACTION... NOW, FINALLY,
THE HOUR HAD COME"**



LIFE IN NELSON'S NAVY

SERVING UNDER NELSON, MANY 19TH-CENTURY SAILORS FACED GRAVER DANGERS THAN THE ENEMY



WORK & WARFARE

Sailors usually started their careers as boys, but during wartime the navy needed an additional 60,000 men for the fleet, and this could include

those who had never gone to sea. The skilled work was carried out by about 20 per cent of the crew, while the rest dealt with heavy hauling.



FOOD & DRINK

Food onboard was of varying quality, and the meat was salted and placed in barrels for preservation. Although much of the food was bland and dry,

sailors received regular meals. They were entitled to a gallon of beer each day and drunkenness onboard was a big problem in the navy.



DISCIPLINE & PUNISHMENT

Discipline onboard ships was harsh, but it was equally harsh on land. The rules on a ship, known as the Articles of War, declared that men could

be hung for mutiny, treason, desertion or sodomy. Lesser forms of punishment were running the gauntlet and flogging.



HEALTH & HYGIENE

With men living in such cramped, damp conditions, disease was rampant, with 50 per cent of all Royal Navy deaths in 1810 attributed to it.

Surgery was far from advanced, with amputations used for any injured limbs, and there are accounts of tubs filled with severed body parts during battles.



PAY & BENEFITS

Poverty forced many men out to sea, and on top of their annual salary, the riches gained from the capture of an

enemy vessel were divided among the men based on rank. Captains enjoyed three-eighths of the reward, however, Nelson often complained about his lack of prize money as he was often posted away from bountiful areas.

commended for his quick thinking and courageous actions. However, this success did not last, as almost the entire British force was struck down with yellow fever. Nelson himself barely recovered with his life, and when he returned to sea in 1784 it was not to a life of daring battles and valiant successes. Instead Nelson's role was to enforce the Navigation Act. He made many enemies, and the loneliness of command saw him sink back into despair and depression. When he returned home he found himself widely unpopular with his kinsmen, without any appointment and unemployed for five long years.

Nelson was battered and bruised, but he was not defeated. His marriage to the widow Frances Nisbet, who had a five-year-old son, revitalised a man who was already far older than his 29 years. Meanwhile, overseas, events were happening that would affect the path his life would take forever.

The people of France were rebelling, the king had been killed, the world was watching, and finally, Nelson was given a ship of his own to command: the 64-gun *Agamemnon*.

At last things in Nelson's life were looking up – he had a loving wife at home, a fast, powerful ship under his command, and an able crew who listened and followed his orders. This dynamic life suited Nelson, and in it he began to flourish. The enthusiastic young man was still there, but another side was emerging, a superb commander capable of flashes of genius. It was during this period, while defending the port of Toulon, that Nelson first crossed swords with a 24-year-old French artillery officer by the name of Napoleon Bonaparte.

It was in this storm of revolution, unrest and war that Nelson achieved some of his lesser-known but equally notable victories against the Spanish at Cape Vincent in 1797 and at the Battle of Copenhagen. The bold, intrepid commander was beginning to carve a name for himself. His men adored him because not

only was he extremely capable, but he was also daring – a trait that cost him the sight in his right eye.

In the British Navy he was something of a rebel, ignoring orders to withdraw. In one instance during the Battle of Copenhagen, he lifted his telescope to his blind eye, pretending not to see the command to withdraw. Nelson's force of will and bullish British spirit won him victory after victory, and although he was admired greatly as a leader, a remnant of the young man seeking affirmation and glory remained. Depression and self doubt were demons that Nelson was doomed to fight until his final day, foes that even a million naval victories and commendations could never

vanquish.

Although a peace treaty had been signed with France in 1802, just a year later war broke out once again. Nelson was appointed commander-in-chief of the Mediterranean fleet and hoisted his flag on the ship that would be forever linked

with his name, HMS *Victory*. His mission was to blockade Toulon to prevent French ships there meeting up with those in the Atlantic and also Spanish ships in Cadiz and Cartagena. Britain was well aware that the prize Napoleon desired most of all was invasion of their own country and its ultimate destruction. With the combined force of these ships, that invasion was a very real possibility. If united, this single invincible fleet could take control of the Channel, enabling the French emperor to ravage Britain and leave it in tatters. It was up to Nelson and his men to stop that happening.

The French Admiral Pierre Villeneuve was a man under pressure. It was under his command that the combined fleet was to sail, and it was up to him to ensure that happened. Although Nelson and his fleet lurked nearby, Villeneuve managed to sneak out of Toulon under cover of bad weather. Upon realising the admiral had moved, Nelson set off in pursuit. The French reunited with some of their ships, but they

“NELSON HAD NEVER DESIRED A LONG, COMFORTABLE LIFE; HE WAS A MASTER OF THE SEAS AND A SEEKER OF ADVENTURE”



NELSON'S ILLNESSES AND INJURIES

NELSON'S TENDENCY TO PUT HIMSELF IN THE HEART OF BATTLE LED TO HIM SUFFERING AN ABUNDANCE OF AILMENTS THROUGHOUT HIS SEAFARING CAREER



Nelson's easily recognisable medals made him a high-value target for French sharpshooters at Trafalgar



This 19th-century painting shows a dying Nelson in the arms of Captain Hardy as the battle wages around him

1771

When Nelson's naval career began, so did his ongoing battle with a sailor's worst nightmare – chronic seasickness. Nelson suffered with the ailment for the rest of his life.

1780

In San Juan, Nelson suffered from a cornucopia of ailments – dysentery, yellow fever, chest pain and even poisoning from a toxic fruit.

1782

Like many sailors at the time, Nelson and his crew suffered from scurvy, and this would become a repetitive sickness that the admiral would later work to eliminate on his ships.

1794

In Bastia, Nelson was almost killed by a huge amount of dirt from a heavy shot falling on him. Days later, he was hit by earth and rocks from an explosion and was blinded in his right eye.

1798

Nelson was hit with a fragment of shot during battle. Again he declared himself dead but continued on commanding the battle while bleeding profusely. Nelson suffered with blinding headaches for the remainder of his life.

1801

Again Nelson proclaimed his death was close when he suffered from severe heatstroke and vomiting, but he recovered remarkably quickly.

1776

Nelson suffered his first bout of what would be a reoccurring sickness – malaria. This first attack almost took his life, but it also gave him a vision of a voice telling him that he would become a hero.

1781

While in London, Nelson complained that his left arm and leg were causing him distress. The fingers on his left hand were also white, numb and swollen.

1787

Upon returning from the West Indies, Nelson was struck down with a fever so severe that a keg of rum was prepared to preserve his body if he were to pass away.

1797

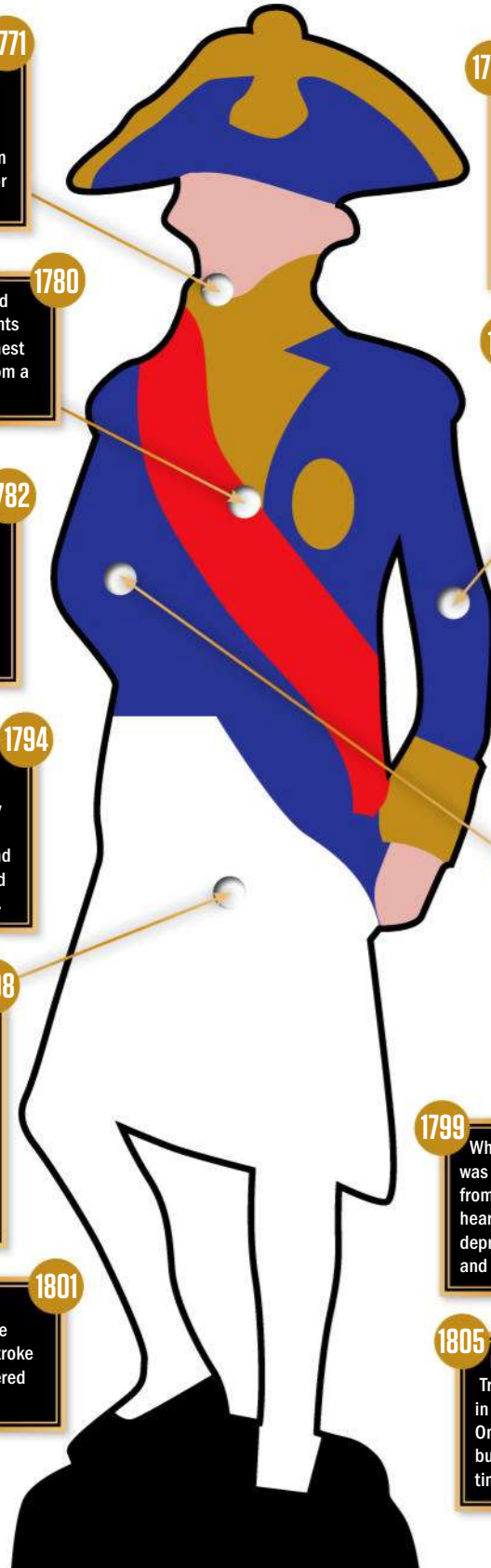
In the midst of battle, Nelson received a musket ball shot above his right elbow. It was declared that he was killed, but the ship's surgeon amputated his forearm. Half an hour later, he returned to battle.

1799

While in Palermo, Sicily, Nelson was reported to be suffering from what he believed to be heart attacks, accompanied by depression, headaches, sickness and indigestion.

1805

During the Battle of Trafalgar, Nelson was struck in the shoulder and spine. Once more he stated, "I have but a short time to live." This time he was correct.





Today HMS Victory is on display at the Portsmouth Historic Dockyard



failed to take control of the Channel so fled south to Cadiz with their fleet.

Napoleon was not pleased with Villeneuve's delay and already had plans to replace him. It was a final accusation of cowardice that forced Villeneuve to leave the harbour, and as far as he knew, there was no British force nearby that could hope to best him. Unfortunately for Villeneuve, he was wrong.

When Villeneuve first made for Cadiz, Nelson had returned home, and for 25 days he had perfected his strategy. Napoleon had refocused his efforts on his Grande Armée in Austria, but in England, invasion by sea still seemed a very real possibility, and Nelson was the hero who could prevent it. On 15 September 1805, Nelson set sail on Victory again, and he was very careful to keep his main fleet well out to sea. Villeneuve had no idea that what he was running into was a strategy designed to stop him for good and a man who still had something to prove.

As the silhouettes of the combined fleet appeared against the sunrise over Cape Trafalgar, the British finally began to move. They split into two divisions, one led by Nelson and the other by Collingwood. Onboard Victory, Nelson ordered his lieutenant to carry a message to the fleet: "England expects that every man will do his duty." Nelson was many things – curious, energetic, even reckless. His adventurous spirit and quest for personal pride

had led him to travel to the furthest reaches of the world, but it had been his duty that kept him there. It was this sense of duty in the face of fear and danger that Nelson instilled in his men that day.

The men had every right to be afraid. Naval tactics at the time meant that almost every battle followed a set sequence – the ships would line up against each other and attack from the broadside cannons. This strategy was such an integral part of naval warfare at the time that it had inspired the name 'ship of the line' for the vessels that took part in it. But Nelson had other plans. He would deviate from the norm, and instead of facing down the line of Villeneuve's fleet in the ordinary fashion, he would attack them from the west, at right angles, in two squadrons. This put Nelson and his men at immense risk, as they were exposed to the fleet's powerful and devastating broadside cannons, but if they could cut their way through, they could slice the fleet in three.

The British aligned themselves into two long lines, and like two arrows, fired forward. They stormed towards the combined fleet, led by the flagships. The Franco-Spanish fleet were not expecting or prepared for such a tactic. The French ship *Fougueux* let off a broadside towards Collingwood's *Royal Sovereign* as he burst through the line, but it was too late. *Sovereign* raked *Santa Ana*, the Spanish flagship, with an attack so devastating that it

disabled 14 guns and 400 crew members.

Victory, meanwhile, was leading the charge towards the two ships *Redoubtable* and *Bucentaure*. With the fleet so crowded together, Victory was forced to ram the ship and fire off broadsides at point-blank range.

The situation was so dangerous that many had urged Nelson to conduct the battle from a safe distance, or at least remove the stars of honour gleaming on his coat. Nelson refused. He had come close to death many times before, but he was convinced that he would meet his end at Trafalgar. He had already said farewell to his friends and family, and if he was going to die, he was going to go out with his medals on his chest.

French sailors in the rigging of *Redoubtable* were already picking off men exposed on Victory's deck. Minutes before Nelson himself was shot, a man standing beside him was blown in half by a cannon ball, but Nelson did not move. Whether it was for pride, bravado or courage, Nelson remained on the deck of his ship. Shortly after 1 p.m., a musket shot hit Nelson, throwing him to the deck floor and shattering his spine. Still calling out instructions to his crew, he was carried below and examined by a surgeon, who confirmed death was imminent.

THE BATTLE OF TRAFALGAR

21 OCTOBER 1805



BRITISH
COMMANDER: HORATIO NELSON
FLEET SIZE: 33 SHIPS
SHIPS CAPTURED: 0
SHIPS DESTROYED: 0
WOUNDED: 1,208
DEAD: 458

FRENCH / SPANISH
COMMANDER: PIERRE CHARLES VILLENEUVE
FLEET SIZE: 40 SHIPS
SHIPS CAPTURED: 21
SHIPS DESTROYED: 1
WOUNDED: 2,538
DEAD: 3,243
CAPTURED: 8,000



BRITISH FLEET

- | | |
|------------------|--------------------|
| 01 VICTORY | 18 ROYAL SOVEREIGN |
| 02 EURYALUS | 19 BELLEISLE |
| 03 TÊMÉRAIRE | 20 MARS |
| 04 NEPTUNE | 21 TONNANT |
| 05 CONQUEROR | 22 BELLEROPHON |
| 06 LEVIATHAN | 23 COLOSSUS |
| 07 BRITANNIA | 24 ACHILLES |
| 08 AJAX | 25 POLYPHEMUS |
| 09 ORION | 26 SWIFTSURE |
| 10 AGAMEMNON | 27 REVENGE |
| 11 MINOTAUR | 28 DEFIANCE |
| 12 SPARTIATE | 29 PRINCE |
| 13 SIRIUS | 30 THUNDERER |
| 14 PHOEBE | 31 DREADNOUGHT |
| 15 NAIAD | 32 DEFENCE |
| 16 PICKLE | 33 AFRICA |
| 17 ENTREPRENANTE | |

FRENCH FLEET

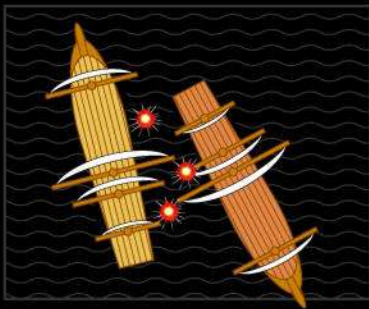
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|----------------|------------------|
| 01 ARGUS | 14 NEPTUNE |
| 02 ACHILLE | 15 BUCENTAURE |
| 03 BERWICK | 16 HÉROS |
| 04 ARGONAUTE | 17 FURET |
| 05 HERMIONE | 18 HORTENSE |
| 06 THÉMIS | 19 MONT BLANC |
| 07 SWIFTSURE | 20 RHIN |
| 08 AIGLE | 21 DUGUAY TROUIN |
| 09 ALGÉSIRAS | 22 FORMIDABLE |
| 10 PLUTON | 23 CORNÉLIE |
| 11 FOUGUEUX | 24 INTÉPIDE |
| 12 INDOMPTABLE | 25 SCIPION |
| 13 REDOUTABLE | |

SPANISH FLEET

- | |
|--------------------------|
| 01 PRINCIPE DE ASTURIAS |
| 02 ARGONAUTA |
| 03 SAN ILDEFONSO |
| 04 SAN JUAN NEPOMUCENO |
| 05 MONTAÑES |
| 06 BAHAMA |
| 07 MONARCA |
| 08 SANTA ANA |
| 09 SAN JUSTO |
| 10 SAN LEANDRO |
| 11 SANTÍSIMA TRINIDAD |
| 12 SAN AGUSTIN |
| 13 SAN FRANCISCO DE ASIS |
| 14 RAYO |
| 15 NEPTUNO |

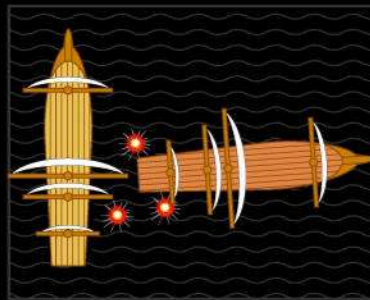
NELSON'S TACTICS

BATTLE AT SEA USUALLY FOLLOWED DEFINED TACTICS, BUT NELSON DEVIATED, RISKED EVERYTHING AND CLAIMED THE MOST DECISIVE VICTORY OF THE WAR



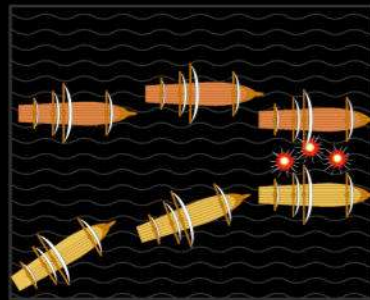
BROADSIDE

Because it was near impossible for ships to fire over the bow or stern, all the guns were positioned along the side of the ship. Because of this, it was the captain's aim to face the side of their ships against the enemy's side and then unleash the cannons in an attack. This was known as a broadside.



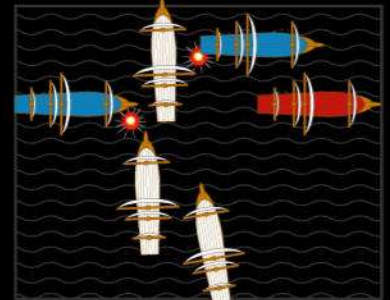
RAKING

A broadside attack was powerful, but it exposed the ship to the enemy ship's fire. It was safer for the vessel to bring its broadside to the bow or stern of the enemy vessel. This meant the ship was able to fire through the entire length of the ship, while the enemy was unable to return fire. This was called 'raking'.



TRADITIONAL FORMATION

Because the main aim of battles was to bring your ships broadside against the enemy's to unleash devastating firepower, ships would be aligned to unleash a torrent of attacks against each other. Often this resulted in two lines of ships sailing parallel and exchanging broadside over and over again.



THE NELSON TOUCH

During the Battle of Trafalgar Nelson made the risky decision to abandon the traditional tactic and instead he attacked the fleet at right angles. His ships underwent a torrent of attacks as they approached, but when they broke through the line, they raked the enemy ships and knocked them out one by one.

NELSON'S LEGACY

We spoke to Roger Knight, who in 2000 changed his career from deputy director of the National Maritime Museum to that of teacher and author. His biggest book is the award-winning *The Pursuit of Victory: The Life and Achievement of Horatio Nelson* (2005). This biography was translated into French in 2015, the first time that this had happened since the 19th century. In September 2016 he published a study guide on Nelson in the Connell Guides series.

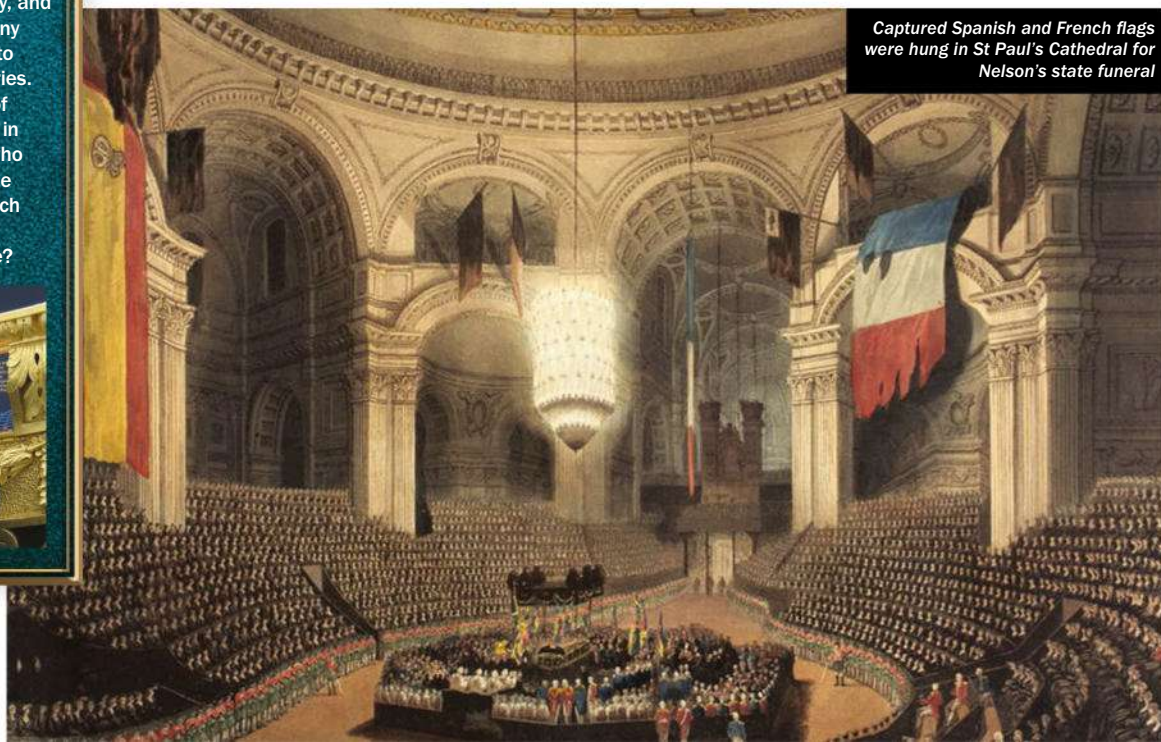
How influential is Nelson and his legacy today?

The legacy of Nelson has had a chequered history, for the straitlaced mid-Victorians did not approve of his relationship with Emma Hamilton and he was quietly dropped as a national hero. However, when the German naval threat emerged at the end of the 19th century, his heroic attributes were resurrected by those who wanted more warships to be built, and he came back into fashion.

The memory of his clear-cut victories led the British public to expect the Royal Navy to overwhelm the Germans in World War I – after the Battle of Jutland in 1916, they were to be disappointed. However, the memory of his character and victories re-emerged as morale-raising propaganda during World War II.

In the 21st century, the Royal Navy no longer has a worldwide role or an empire to defend and is a fraction of its mid-20th-century size. Yet Nelson's influence remains, and he is still in the first rank of national heroes. Navies around the world still study his leadership and management methods, when, most unusually for the time, he trusted and delegated responsibility downwards. One change that has taken place is that historians know much more about the officers, seamen and ships of the Georgian sailing navy, and studies of Nelson take the role of many other people and historical factors into account when writing about his victories.

Perhaps the most difficult strand of Nelson's legacy to analyse is the way in which he is still seen as the person who led the national resistance against the might of Napoleonic France. How much does his memory affect our complex relations with the continent of Europe?



Captured Spanish and French flags were hung in St Paul's Cathedral for Nelson's state funeral



With 50 guns on each side, the crew of Victory worked tirelessly to defeat the combined fleet

Despite his injuries and suffering immense pain, Nelson constantly asked for updates on the battle. Before he died, he was informed that the British fleet had taken 15 enemy ships. Nelson's dangerous tactic had worked; he knew he had won. As he drew his last breath, his beloved flag captain Hardy kissed his forehead and Nelson uttered his final words: "Now I am satisfied. Thank God, I have done my duty."

Nelson had never desired a long, comfortable life; he was a master of the seas and a seeker of adventure. As he left this world with the news of his greatest victory ringing in his ears, he departed it, finally, with pride.

Nelson's fatal injury caused him to miss the climax of the battle, where three British ships battered the French flagship Bucentaure into submission and Villeneuve was forced to surrender. All around British ships were tearing holes into the combined fleet. The French ship

Achille refused to surrender and was blown up with everyone onboard.

By the end of the battle, the British had suffered 1,666 casualties, while the combined fleet's casualties numbered near 14,000. France and Spain lost approximately 21 ships in the battle, while Britain lost none. Napoleon's plans to invade England were well and truly thwarted.

The victory at Trafalgar cemented British dominance of the sea, a mastery that would go unchallenged for ten more years of war and more than 100 years of worldwide naval domination. However, this victory was completely overshadowed in England by the news of Nelson's death. He had been the nation's hero before he departed, and when his body was returned he was their martyr. Nelson's body was preserved for the journey back in a cask of rum, as the admiral had requested a land burial. He was honoured

with a magnificent state funeral at St Paul's Cathedral, and his popularity among the people soared. His image was carved into countless statues and monuments, streets were named after him, and his flagship was painstakingly preserved, surviving today as the oldest naval ship still in commission.

Nelson's rise from a small, sickly child to the greatest and most-beloved war hero in British history is unlikely to ever be repeated. He remains a key part of British identity, and his famous column resides at the heart of the capital. The man himself has taken on an almost god-like status, a source of pride, duty and bravery. But he was also a man who was led by a desire to prove himself and who suffered with self doubt. Perhaps this is Nelson and Britain's greatest achievement; not a naval victory, but the willpower and bravery to sail against the winds of uncertainty and fear and to ultimately overcome.

Nelson's Column, in the heart of London, is a permanent reminder of the admiral's sacrifice



HMS VICTORY

FAMOUS FOR ITS PIVOTAL ROLE IN THE BATTLE OF TRAFALGAR, TODAY HMS VICTORY SERVES AS A LIVING, BREATHING MUSEUM OF THE GEORGIAN NAVY

Although Victory is famous for its part in Trafalgar, Victory as a ship had experienced many battles before Nelson commanded it, and many more afterwards. Laid down in 1759 and launched in 1765, Victory was commissioned as a new first-rate ship. The vessel was unusually large during a period when smaller, faster ships were used by the British Navy, but with 100 – and eventually 104 – guns onboard, it was a force to be reckoned with. Victory took part in the battles of Ushant, the Siege of Gibraltar and the Battle of Cape St Vincent before it was reconstructed for Nelson and Trafalgar. The vessel was fated to outlive its famous master and sailed on numerous expeditions into the Baltic before being finally moored in Portsmouth in late 1812.

“THE VESSEL WAS UNUSUALLY LARGE DURING A PERIOD WHEN SMALLER, FASTER SHIPS WERE USED”

POLE MASTS

Victory's masts were made from several large strips of wood bound together securely with iron hoops.

SIZE

Victory measured 69.34m overall and could move at a maximum speed of eight to nine knots (15 to 17kph). It also required 821 crew members to sail it sufficiently.

FIGUREHEAD

Originally, Victory carried a heavy, ornate, decorative figurehead, but this began to rot and was replaced with a far lighter, simpler and practical design.

GUNS

Victory originally boasted 100 guns, but restorations before Trafalgar took the ship to 104 guns over four decks. The cannonballs fired at Trafalgar weighed up to 15kg.

CHAINWALES

Chainwales were the fixings at the side of the vessel for standing rigging sat on the upper deck gun ports. This prevented the rigging from interfering with the guns when fired.

TOPS

Reducing weight and increasing speed was a big priority when reconstructing Victory, so the tops, originally made from heavy oak, were replaced with ones made from fir in two halves.

PAINTWORK

Between 1800 and 1803, Victory underwent significant repairs, and it was then that it was painted with the iconic black and yellow streaks. This would later be adopted by all Royal Navy warships.

GUN DECK

Victory carried 32lb (14.5kg) guns on the lower gun deck. Not only did they use less gunpowder than the previous 42lb (19kg) ones, but they were also lighter and quicker and easier to load.

WAR ON THE WAVES

THE 20TH CENTURY WOULD BEAR WITNESS TO THE RISE OF THE DREADNOUGHT, A FIERCE NAVAL RACE AND THE HEIGHT OF NAVAL POWER

70 Pre-WWI arms race

Inside the scramble between Britain and Germany to dominate the seas

72 Naval technology

Examine the technologies advances that changed war at sea forever

74 HMS Dreadnought

Explore the 1906 vessel that broke new ground and revolutionised naval designs

76 Head to head

The men, methods and machines that spearheaded Britain and Germany's quest to rule the Atlantic

78 Battle of Jutland

Could a little less caution have enabled the Royal Navy to finish off the German Imperial Fleet in May 1916?

80 When battleships ruled the waves

We talk to Royal Navy expert Nick Hewitt about how metal battleships muscled their way to the top of naval warfare

82 Sub hunters

As World War II raged on Britain faced the prospect of starvation thanks to relentless U-boat attacks on Allied convoys. New methods would be needed in order to hit back and avert the disaster of defeat

90 Midway

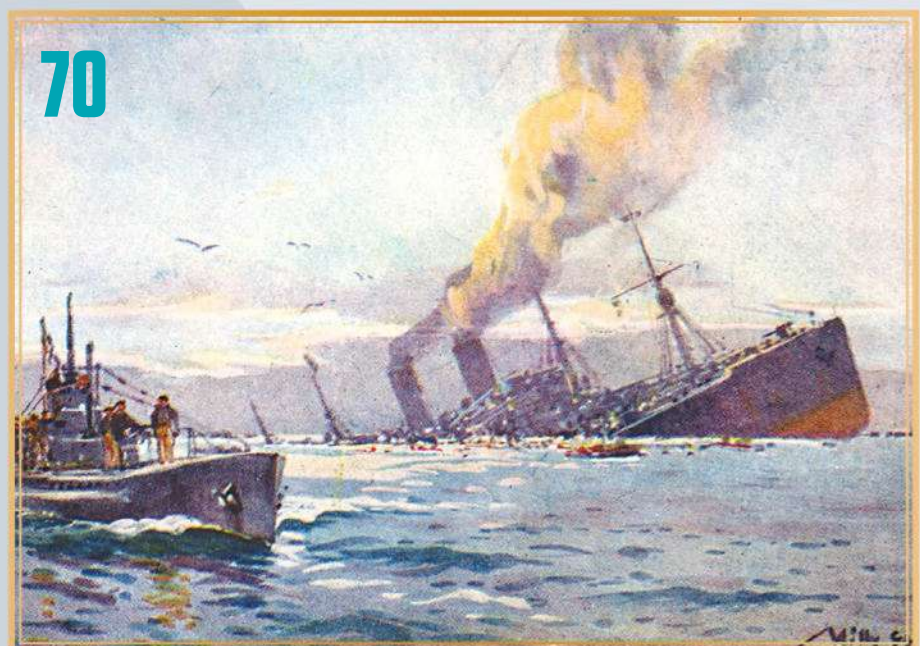
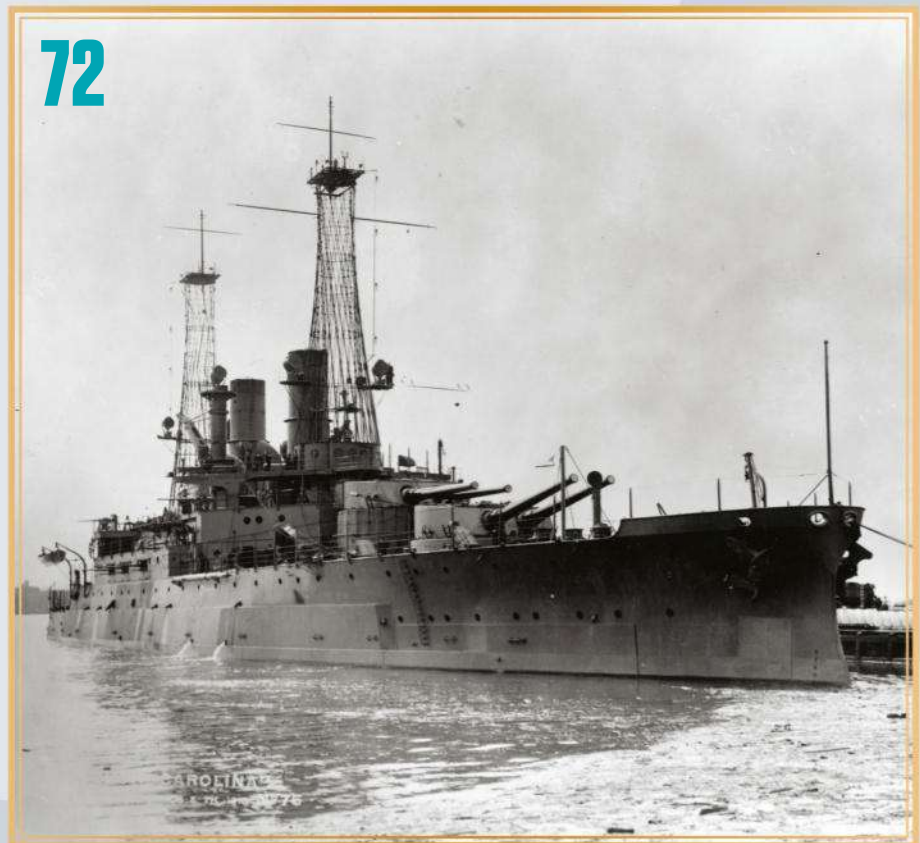
The course of the war in the Pacific turned in the wake of a savage US mauling of the Imperial Japanese Fleet

98 Battle of Leyte Gulf

Dive into the largest naval clash of WWII, a fight that saw the dawn of kamikaze attacks and the end of the Japanese threat at sea

102 Yamato: Japan's doomed flagship

Despite defeat having become a certainty, the shamed leaders of Japan's navy insisted on a suicide mission that would cost thousands of lives and the nation's finest ship



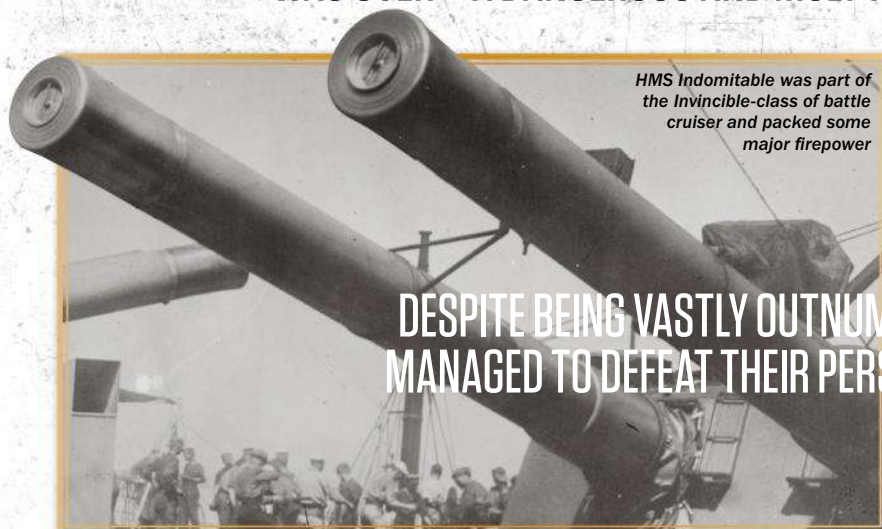
**“B-24 LIBERATORS MANAGED TO SINK
MORE THAN 70 U-BOATS DURING THE
BATTLE OF THE ATLANTIC”**

82



PRE-WWI ARMS RACE

AFTER THE ANGLO-JAPANESE TREATY OF 1902, BRITAIN'S AGE OF SPLENDID ISOLATION WAS OVER – A DANGEROUS AND MULTIPOLAR ERA WAS BEGINNING



HMS Indomitable was part of the Invincible-class of battle cruiser and packed some major firepower

DESPITE BEING VASTLY OUTNUMBERED, THE GREEKS MANAGED TO DEFEAT THEIR PERSIAN ENEMIES AT SEA

THE NASSAU-CLASS BATTLESHIP

The German High Seas Fleet launches its first dreadnoughts

COMMISSIONED: 1910

COUNTRY: German Empire

The four Nassau-class battleships were Germany's first riposte to HMS Dreadnought. They were slower, rolled in heavy seas and were equipped with smaller 11in (28cm) guns, but the arrangement of their turrets allowed them to match Dreadnought shot for shot: eight guns for forward and aft firing, and six for a broadside.

THE INVINCIBLE-CLASS BATTLE CRUISER

As the arms race intensified, the Royal Navy commissioned the revolutionary 'battle cruiser'

COMMISSIONED: 1908

COUNTRY: British Empire

In 1908, Imperial Germany passed the Second Amendment to the Naval Law, a plan for an expanded High Seas Fleet. In response, John 'Jackie' Fisher improved on the HMS Dreadnought and added a second revolutionary design to the Royal Navy's arsenal. Fast and lethal, the battle cruiser was as quick as an armoured cruiser but as heavily armed as a battleship.

RICHARD BURDON HALDANE

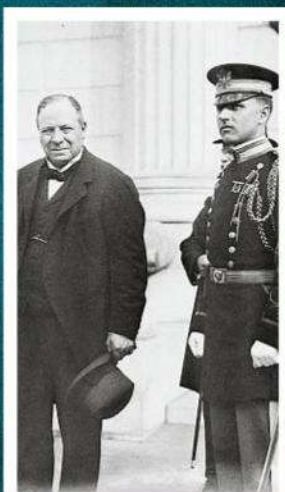
Concerned by Germany's armed response to Dreadnought, Britain's secretary of state for war travelled to Germany for crisis talks

YEARS ACTIVE: 1905-12

COUNTRY: British Empire

Richard Burdon Haldane regularly met with Kaiser Wilhelm to try to agree terms. Peace talks came to a head in 1912, when Haldane travelled to Germany to quell the friction. Haldane's mission lasted four days and ended in failure when Germany announced further expansion to its navy. Luckily, Haldane was in fact fully prepared for a European war, implementing widespread reforms to the British Army throughout his tenure.

Right: After struggling to suppress Germany's imperial ambitions, Haldane ensured that the British forces were ready for action



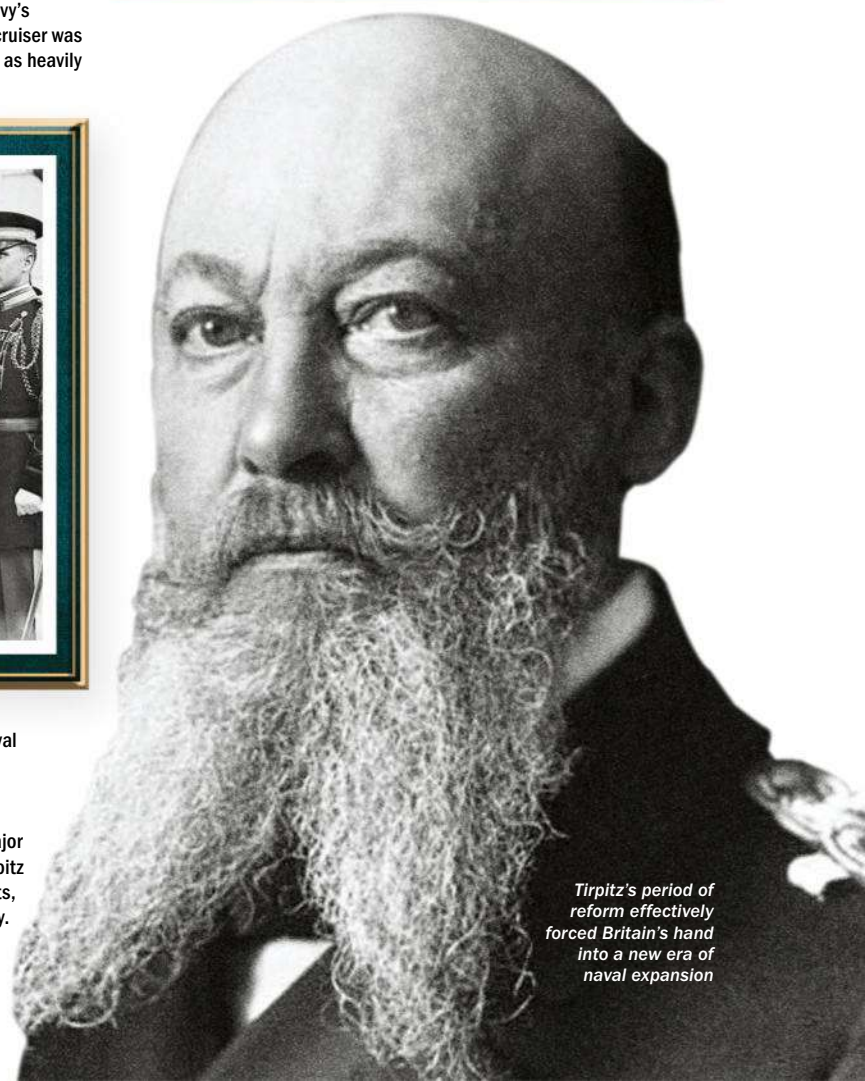
ALFRED VON TIRPITZ

The aggressive and enthusiastic secretary of state who transformed the German presence on the seas

YEARS ACTIVE: 1897-1916

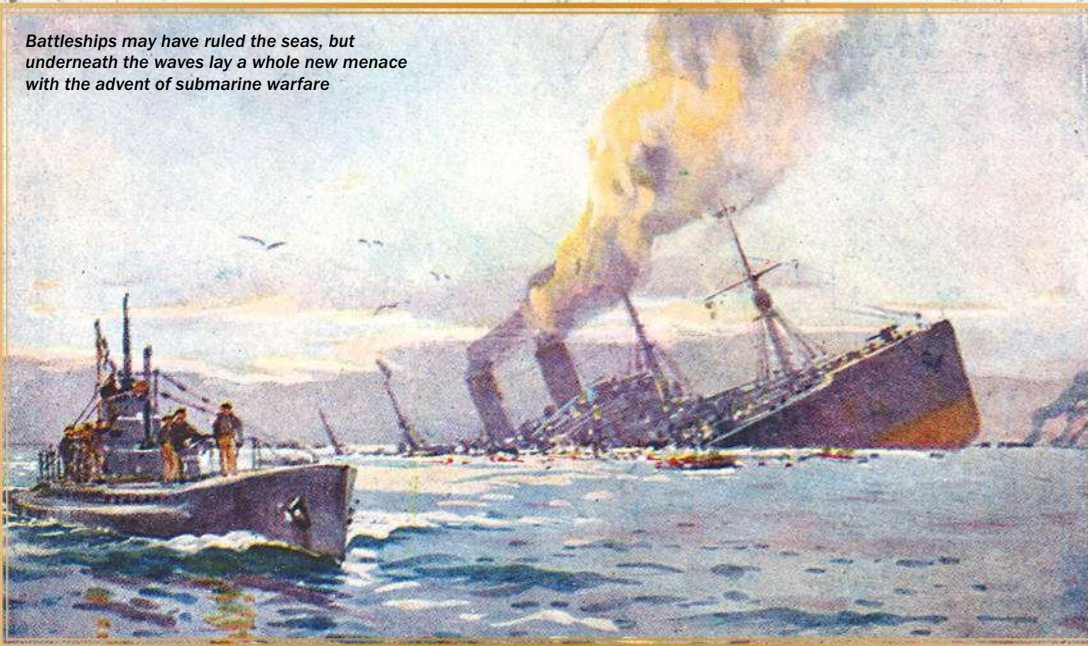
COUNTRY: German Empire

Without Tirpitz's championing of the five Naval Laws passed between 1898 and 1912, the Anglo-German naval arms race would have been very different. His enthusiasm for a drastically expanded German navy led to major reform in pursuit of Britain's dominance. Tirpitz was the mastermind of radical advancements, making clear that Britain was now the enemy.



Tirpitz's period of reform effectively forced Britain's hand into a new era of naval expansion

Battleships may have ruled the seas, but underneath the waves lay a whole new menace with the advent of submarine warfare



HMS QUEEN ELIZABETH: THE SUPER-DREADNOUGHT

The oil-powered behemoth and the first 'fast battleship'

COMMISSIONED: 1914
COUNTRY: British Empire

Like the battle cruiser, the 'fast battleship' was developed in response to the increasing power and speed of the dreadnoughts. The first of the fast battleships, the Queen Elizabeth carried eight 15in (38cm) guns on its centreline. It had four turrets, as dispensing with the fifth created space for its new oil-powered turbines.



U-31 SUBMARINE

The invisible dreadnought hunter beneath the waves

COMMISSIONED: 1914
COUNTRY: German Empire

During an annual pre-war British fleet exercise, two British submarines posing as enemy infiltrators were able to torpedo three battleships. Britain may have had the edge with its battleships and battle cruisers, but in 1914 Germany launched its first diesel-powered submarine, U-31, with a range of 12,553 kilometres. Submarines would strike fear into the hearts of Royal Navy admirals as the arms race took another turn.

"SUBMARINES WOULD STRIKE FEAR INTO THE HEARTS OF ROYAL NAVY ADMIRALS AS THE ARMS RACE TOOK ANOTHER TURN"

THE KOENIG-CLASS

Germany adopts 'super-firing' turrets on the centreline

COMMISSIONED: 1914
COUNTRY: German Empire

The four Koenig-class battleships carried their ten 12in (30cm) guns on the centreline for a wider arc of fire, and their five turrets were stacked in a new 'super-

firing' arrangement. In battle, SMS Koenig displayed the new defensive capabilities of German vessels when it was struck by fire. It was able to flood some of its magazines when they caught fire, and then take on tons of water before retreating.

Below: The British and German fleets were so precious to their respective nations that the admirals were afraid for them to take any sort of damage



5 facts about THE ANGLO-GERMAN NAVAL ARMS RACE

THE GREAT 'DREADNOUGHT HOAX'

In 1910, the practical joker Horace de Vere Cole tricked the Royal Navy into letting a party of 'Abyssinian royalty' inspect HMS Dreadnought. The 'royals' were five members of the Bloomsbury group in disguise.

THE RAMMING OF U-29

In Pentland Firth, Scotland, in March 1915, HMS Dreadnought rammed and sank the German submarine U-29. This is the only time that a battleship has been able to sink a submarine.

HMS AGINCOURT, THE HEAVIEST DREADNOUGHT OF WORLD WAR I

Carrying 14 12in (30cm) guns in seven turrets and weighing 30,250tn, HMS Agincourt was the most heavily armed for its size of all the dreadnoughts in World War I.



THE BATTLE CRUISER'S FATAL FLAW?

When one of the Invincible's turrets caught fire at the Battle of Jutland, the poor design in its ammunition handling exposed cordite charges to the flames. Invincible and two other battle cruisers were destroyed in this way.

LAST OF THE DREADNOUGHTS

Launched in 1912, the USS Texas served in the Normandy landings and at Iwo Jima and Okinawa. Today, the only surviving dreadnought is a floating museum in Houston, Texas.



Source: Wiki / CC / PD - Art

NAVAL TECHNOLOGY

POWERED BY STEAM TURBINES AND PACKING BIG-GUN POWER, HMS DREADNOUGHT AND ITS SUCCESSORS REDEFINED THE BATTLESHIP FOR THE 20TH CENTURY

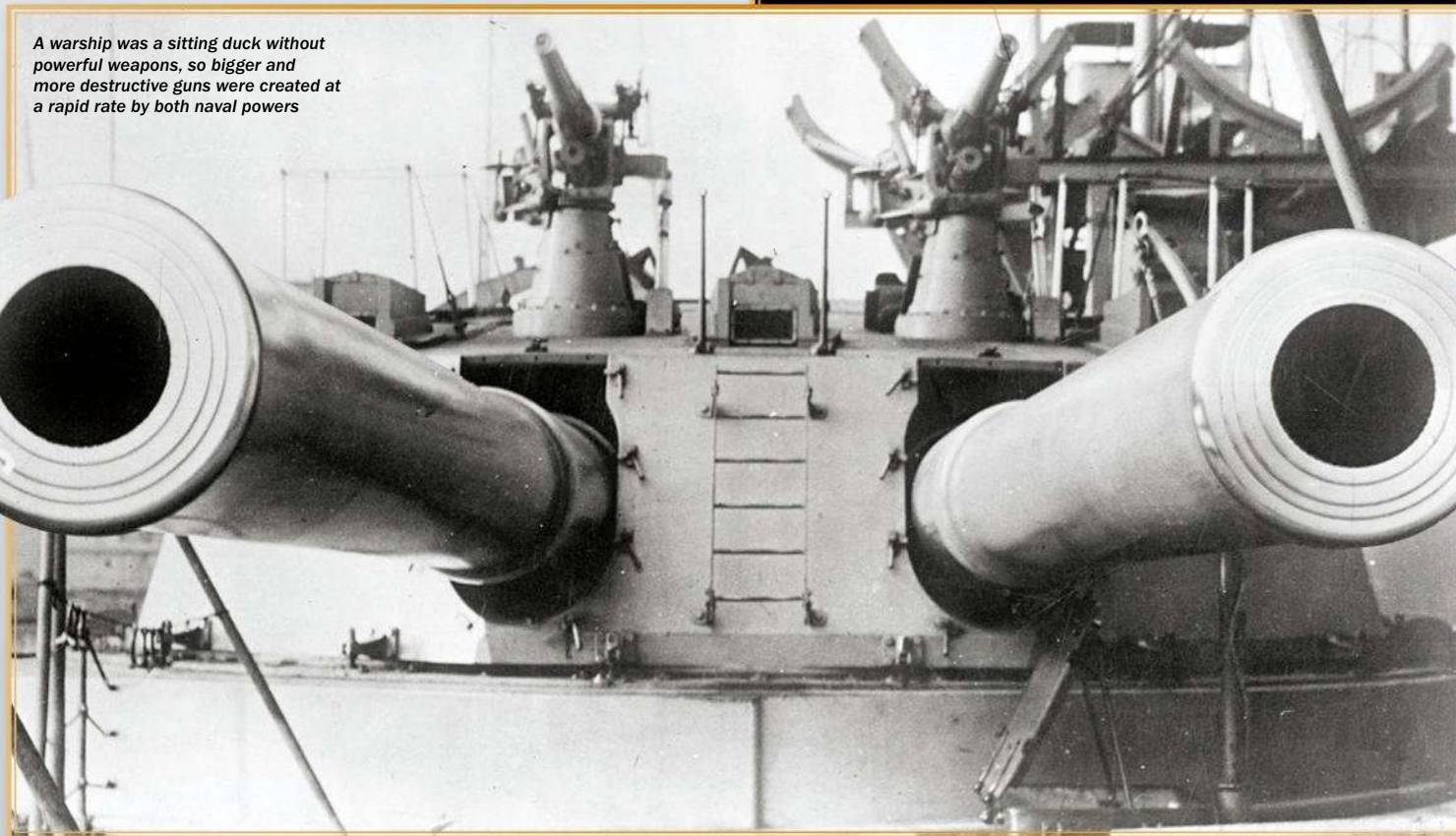
In 1904, with tension rising on the oceans, Sir John 'Jackie' Fisher, the visionary First Sea Lord of the admiralty, commissioned a new kind of battleship. Armed with long-range 12-inch (30-centimetre) guns, propelled by steam turbines and protected by armour and internal bulkheads, the dreadnoughts were a new and powerful package of metal and machinery.

BL 12-INCH MARK X GUNS

ORIGIN: Great Britain

The ten 12in (30cm) guns of Dreadnought's main armament fired high-explosive shells and had a range of 23km. They were mounted in five powered turrets: one forward, one aft, one amidships on the centreline and two in the 'wings', either side of the armoured superstructure.

A warship was a sitting duck without powerful weapons, so bigger and more destructive guns were created at a rapid rate by both naval powers



KRUPP CEMENTED ARMOUR

ORIGIN: Germany

Launched in 1911, Germany's Kaiser-class dreadnoughts used steel armour 'cemented' with metal alloys to minimise cracking during long engagements. Their deck armour was nearly four inches thick in the ships' crucial zones. Their waist was doubly protected: first by a 14in (36cm) 'armoured belt' and then by an inner 'torpedo bulkhead'.



The SMS Kaiser depicted on a postcard. The ship would meet its end at a mass scuttling of the German fleet in 1919

HMS Queen Elizabeth went on to serve in WWII after two rebuilds



OIL-FIRED BOILERS

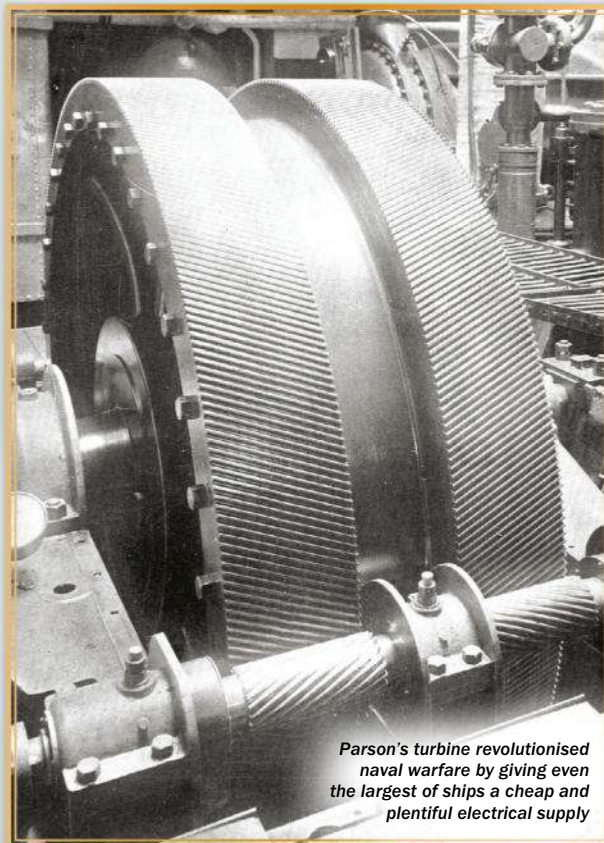
ORIGIN: Great Britain

Dreadnought's coal-powered boilers left a thick tell-tale trail of smoke. The Queen Elizabeth-class 'super-dreadnoughts', launched in 1913, were oil-powered. Oil is more energy dense than coal, requires no stokers and produces less smoke. Winston Churchill, First Lord of the Admiralty, guaranteed to maintain a supply of these versions of the dreadnought, which were much more efficient than previous incarnations.

PARSON'S DIRECT-DRIVE STEAM TURBINE

COUNTRY: Great Britain

Invented by Charles Parsons in 1884, steam turbines enabled high-speed, long-range cruising. HMS Dreadnought carried two pairs of direct-drive Parsons turbines. Each was powered by 18 Babcock and Wilcox water-tube boilers and drove two shafts with triple-blade propellers. HMS Dreadnought's top speed was 21.6 knots (40kph).



Parson's turbine revolutionised naval warfare by giving even the largest of ships a cheap and plentiful electrical supply

SUPER-FIRING TURRETS

COUNTRY: United States

The USS South Carolina, launched in 1910, stacked one turret above and slightly behind another. This 'super-firing' design compressed firepower into a smaller space and produced a smaller target, but designers feared that the shock waves from the fire of one turret might damage the other. The innovative design came as a surprise to Germany and Britain, who would go on to use it on the Orion and Kaiser classes respectively.



Super-firing turrets were a US invention that improved on designs patented by both Germany and Britain

"ARMED WITH LONG-RANGE GUNS, PROPELLED BY STEAM TURBINES AND PROTECTED BY ARMOUR AND INTERNAL BULKHEADS, THE DREADNOUGHTS WERE A NEW AND POWERFUL PACKAGE OF METAL AND MACHINERY"

HMS DREADNOUGHT

THE DOMINANT BATTLESHIP OF ITS ERA, THIS NEW VESSEL REVIVED THE NAVAL ARMS RACE THAT INTENSIFIED ANGLO-GERMAN TENSIONS IN THE LEAD UP TO WORLD WAR I

HMS DREADNOUGHT

CREW MEMBERS 773

LENGTH: 160.6m

BEAM: 25m

DRAUGHT: 7.9m

DISPLACEMENT: 18,420tn

TOP SURFACE SPEED: 21kts (39kph)

RANGE: 6,620 nautical miles (12,260km)

MODERN OPTICAL RANGEFINDERS

HMS Dreadnought was the most accurate battleship of its time in determining distance. It was fitted with an electrical rangefinder developed exclusively by Barr and Stroud, two physics and engineering professors at the Yorkshire College (now the University of Leeds).

CONSTRUCTED
IN 366 DAYS

POUNDER GUNS

Dreadnought's pounder guns acted as a form of defence against torpedo boats. Placed either at the top of the turrets or on the side of the ship, these 76mm guns had a range of 8.5km.

DUMARESCO
MECHANICAL
COMPUTER

TRANSMITTING STATION

A new Vickers Range Clock was used onboard HMS Dreadnought for continuously calculating the changing range between the target vessel and an enemy ship. Corrections could be made to update the clock at any time, so the ship was always one step ahead.

STRATEGIC MAN POWER

Reversing a trend set in stone for centuries, HMS Dreadnought housed its officers and enlisted men forward, much closer to the bridge, in an effort to ensure that everybody onboard was as close to their action stations as possible.

KRUPP CEMENTED ARMOUR

Krupp armour, which carbonised steel for greater hardness, was replaced at the turn of the 20th century by Krupp cemented armour and used to make HMS Dreadnought. Its revolutionary composition promoted greater elasticity, reducing the chances of cracking.

REDUCED
WATERLINE BELT

QUICKER THAN THE REST

HMS Dreadnought was the first ship to use an experimental steam turbine engine rather than the triple-expansion engine. At the time, it was the quickest ship ever, reaching a speed of 21 knots (39kph) despite its extra, weighty firepower.

“HMS DREADNOUGHT WAS THE FIRST TRULY MODERN WARSHIP, COMBINING A REVOLUTIONARY ARMAMENT SUPPLY, AN ELECTRONIC RANGEFINDING WEAPONS SYSTEM AND ADVANCED SPEED TECHNOLOGY”

ATTACKING FIREPOWER

Dreadnought was the world's most feared battleship because of its astonishing firepower. It was built to shine in combat situations thanks to its five 12in (30cm) twin-gun turrets that had a range of up to 23km.

THREE CENTRAL TURRETS FOR WEIGHT STABILISATION

TORPEDO CONTROL TOWER

SUPERIOR FIRE CONTROL

All 12in (30cm) guns onboard had identical ballistic characteristics, which simplified the task of adjusting fire in battle. This was previously not possible because guns of a different calibre created different splashes and observers would not be able to guide effectively.

23,000 SHAFT HORSE POWER

FIRE DOORS

A major improvement on what came before it, HMS Dreadnought removed longitudinal passageways between compartments below deck. Taking cues from submarines, the ship's connecting doors were to be kept shut to prevent the spread of fire and flooding.

HMS DREADNOUGHT'S PLACE IN HISTORY

As the figurehead of the Royal Navy, HMS Dreadnought kick-started a new era of ship development. Although it wasn't the first 'big-gun' ship in production – that honour is bestowed on Imperial Japan's unsuccessful attempt to build the IJN Satsuma in 1904 – its design sent shock waves across the naval world.

Built in direct response to German efforts to challenge British supremacy on the high seas, HMS Dreadnought was the first truly modern warship, combining a revolutionary armament supply, an electronic rangefinding weapons system and advanced speed technology to render its rivals redundant.

Its iconic status is therefore secured despite never sinking another battleship.

FUEL SUPPLY

At full capacity, Dreadnought could steam for 6,620 nautical miles (12,260km) at 10kts (19kph). It carried 2,914tn of coal and 1,140tn of fuel oil that was sprayed on to increase its burn rate.

HEAD TO HEAD



ROYAL NAVY VS IMPERIAL GERMAN NAVY



THE TWO GREATEST NAVAL POWERS OF THE ERA WERE BOTH DETERMINED TO COME OUT ON TOP IN THE BATTLE ON THE HIGH SEAS



Battleships line up for the 1909 King's Review of the Home Fleet and the Atlantic Fleet at Spithead

THE BEGINNING OF THE END FOR PAX BRITANNICA

By the tail-end of the 19th century, Britain was the most technologically advanced nation on Earth. However, the empire was becoming more and more of a financial and military burden, with British forces thinly spread over its borders. What Britain still had was a

strong navy. Wary of unified Germany's new-found industrial might, naval funding was increased and the drive to stay on top was at hand. With huge backing from the British public, the harbour furnaces were lit and the road to a new naval supremacy began.

THE ROYAL NAVY

SHIPS

Germany may have been the plucky underdog, but the British Grand Fleet always had its nose ahead throughout the arms race, both in quality and quantity.

LEADERS

Richard Burdon Haldane was one of the major players in the British war effort but failed to improve relations with the Germans, regularly losing out to Tirpitz in deals and pacts.

MANPOWER

Some accounts suggest that British sailors had the initiative trained out of them, but years of Britannia ruling the waves resulted in legions of experienced sailors.

PORTS

A rich naval heritage meant that Britain had numerous ports at its disposal, from Liverpool and Portsmouth in England to Scapa Flow in the Orkney Islands.

ALLIES

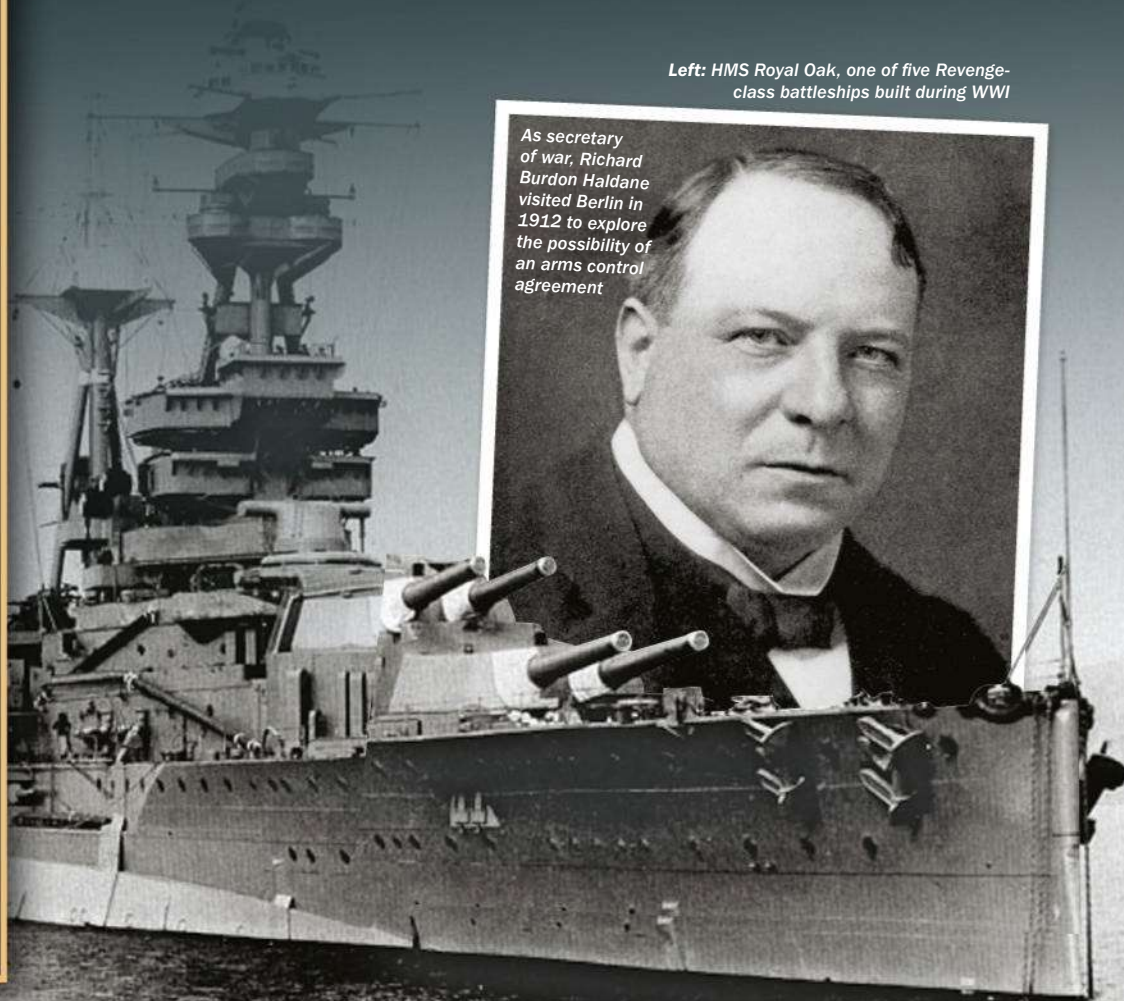
The French and the Russian navies were vital in the war effort in the Mediterranean and the Baltic respectively. The US entered too late to make a decisive naval contribution.

TOTAL

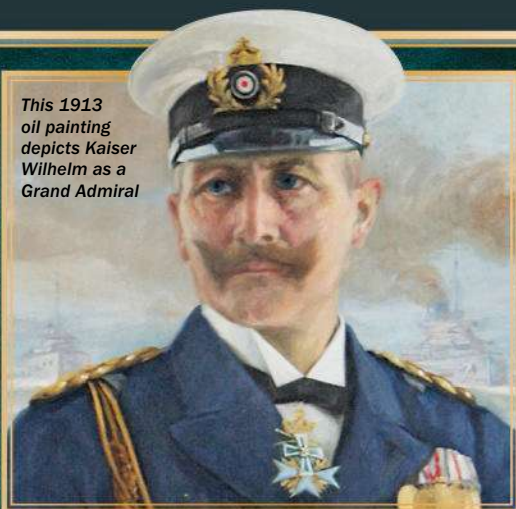


Left: HMS Royal Oak, one of five Revenge-class battleships built during WWI

As secretary of war, Richard Burdon Haldane visited Berlin in 1912 to explore the possibility of an arms control agreement



This 1913 oil painting depicts Kaiser Wilhelm as a Grand Admiral



THE IMPERIAL GERMAN NAVY

Paranoid by a fear of encirclement and driven by a desire to compete with the world's elite nations, Germany was hungry for more military power. The era of Bismarck was over and Kaiser Wilhelm began to pioneer the idea of Weltpolitik, believing that an all-powerful High Seas Fleet would be the best way to realise his grand imperial ambitions. Germany was a young nation, barely 50 years old, and these assertive aspirations would send shock waves through Britain, Russia and France, who were compelled to respond.

THE IMPERIAL GERMAN NAVY

SHIPS

Despite Germany's best efforts, Britain's geographical location meant that it could always delegate more of its resources to naval production, which was imperative to its survival as a military power.

PORTS

Although Germany had large harbours, the likes of Kiel, Hamburg and Wilhelmshaven could not compete with the sheer number of ports that Britain had access to.

LEADERS

In the Anglo-German rivalry, Germany held all the cards, and the likes of Tirpitz and Bülow continuously prevented British efforts to reduce the size of the German fleet.

ALLIES

Germany's allies were Austria-Hungary and the Ottoman Empire. In terms of naval power, both these states were flawed – Austria-Hungary was landlocked and the Ottoman Empire's former strength was already waning.

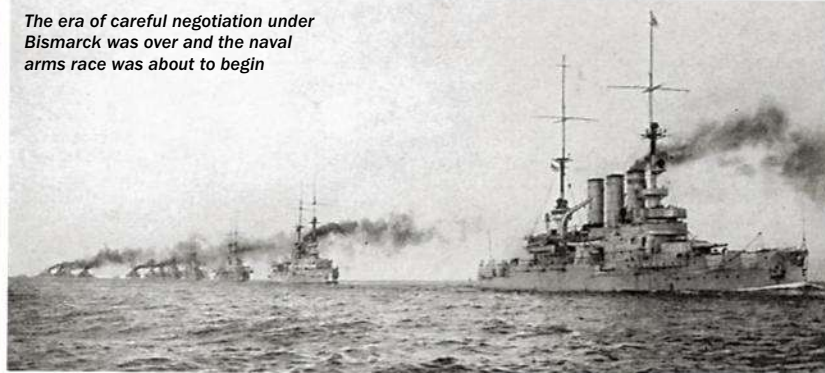
MANPOWER

Training was better on ships in the Imperial German Navy and the force only had to focus on the Atlantic.

TOTAL



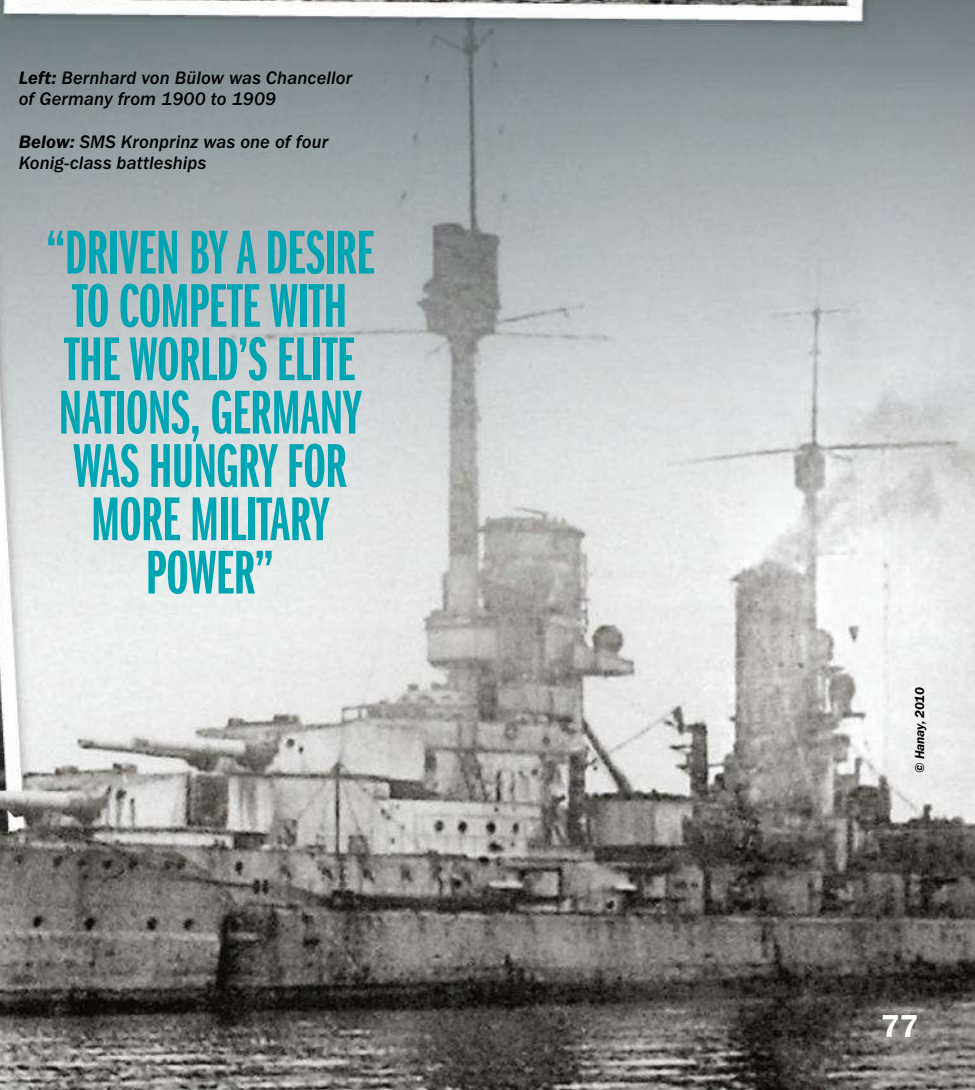
The era of careful negotiation under Bismarck was over and the naval arms race was about to begin



Left: Bernhard von Bülow was Chancellor of Germany from 1900 to 1909

Below: SMS Kronprinz was one of four König-class battleships

“DRIVEN BY A DESIRE TO COMPETE WITH THE WORLD'S ELITE NATIONS, GERMANY WAS HUNGRY FOR MORE MILITARY POWER”



BATTLE OF JUTLAND

31 MAY, 1916. AFTER YEARS OF BUILDING UP BATTLESHIPS TO DOMINATE THE OCEANS, THE BRITISH AND GERMAN NAVIES FINALLY CAME TO BLOWS IN THE NORTH SEA

In early 1916, the North Sea was far from the battleground it would become, as the Royal Navy continued its blockade of the Imperial German Navy. Admiral Reinhardt von Scheer's appointment that year changed things, as he ordered his ships to break out against the British barricade. Across the water, the British had grown tired of months spent skirmishing with German vessels and were already mobilising in response. The Royal Navy's Grand Fleet would finally face off against the German High Seas Fleet, as the results of the long arms race finally came to fruition.

"THE BRITISH, TIRED OF MONTHS SPENT SKIRMISHING WITH GERMAN VESSELS, WERE ALREADY MOBILISING"

THE NAVIES OF JUTLAND

THE STRENGTH OF THE TWO NAVIES AT WWI'S DEFINING SEA CONFLICT

DREADNOUGHTS

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|--------------|------------------------|---------------------------|
| DREADNOUGHTS | 28 | 16 |

PRE-DREADNOUGHTS

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|------------------|------------------------|---------------------------|
| PRE-DREADNOUGHTS | 0 | 6 |

BATTLE CRUISERS

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|-----------------|------------------------|---------------------------|
| BATTLE CRUISERS | 9 | 5 |

LIGHT CRUISERS

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|----------------|------------------------|---------------------------|
| LIGHT CRUISERS | 26 | 11 |

DESTROYERS

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|------------|------------------------|---------------------------|
| DESTROYERS | 77 | 61 |

SEAPLANE CARRIERS

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|-------------------|------------------------|---------------------------|
| SEAPLANE CARRIERS | 1 | 0 |

ARMOURED CRUISERS

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|-------------------|------------------------|---------------------------|
| ARMOURED CRUISERS | 8 | 0 |

MINELAYERS

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|------------|------------------------|---------------------------|
| MINELAYERS | 1 | 0 |

| | BRITISH GRAND FLEET | GERMAN HIGH SEAS FLEET |
|------------|------------------------|---------------------------|
| MINELAYERS | 1 | 0 |

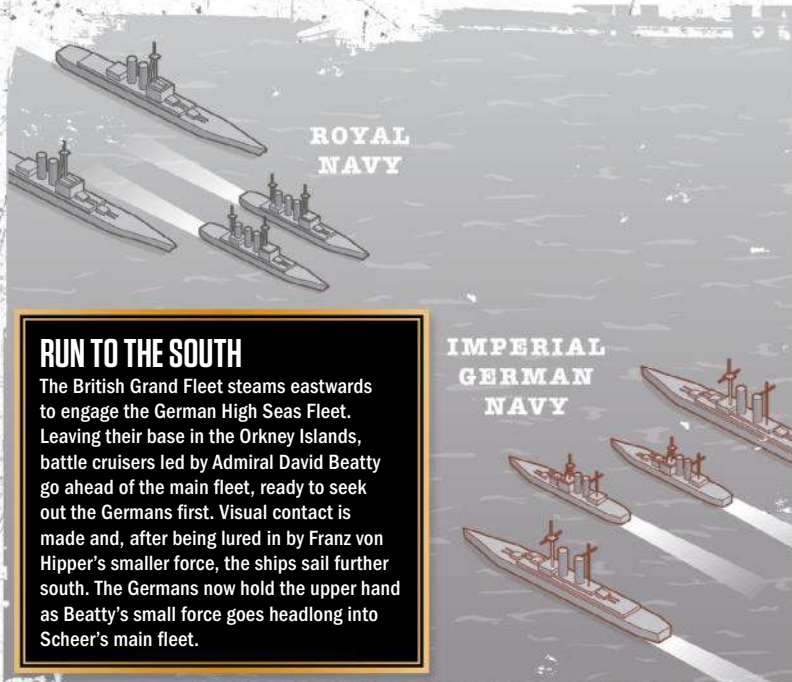


While no dreadnoughts were lost, three British battle cruisers and eight destroyers were sunk by the Germans at Jutland

HOW THE END OF THE ARMS RACE PRODUCED BITTERSWEET VICTORY

For two very proud nations, the loss of ships was hard to take. Although no dreadnoughts were sunk, many destroyers and battle cruisers were lost by both navies, with Britain recording more casualties. Despite losing more vessels and manpower, the German retreat meant the Royal Navy now had undisputed control of the North Sea, but the lack of a stunning victory was not lost on the British public, who were expecting a success of Trafalgar proportions. The inconclusive result of the battle was disappointing to the military hierarchy as well, as it was hoped that these metal leviathans could turn the tide of the war.

Admiral Jellicoe was criticised by Churchill for not taking a riskier approach, and it is true that if he hadn't feared a torpedo attack to such an extent he could have knocked the German Navy out of the war at Jutland. However, this takes away from the key manoeuvres and tactics that Jellicoe exercised prior to this moment. So soon after one of the largest arms races of all time, the role of battleships had changed and the age of the submarine and aircraft carriers was about to begin.



RUN TO THE SOUTH

The British Grand Fleet steams eastwards to engage the German High Seas Fleet. Leaving their base in the Orkney Islands, battle cruisers led by Admiral David Beatty go ahead of the main fleet, ready to seek out the Germans first. Visual contact is made and, after being lured in by Franz von Hipper's smaller force, the ships sail further south. The Germans now hold the upper hand as Beatty's small force goes headlong into Scheer's main fleet.

IMPERIAL GERMAN NAVY



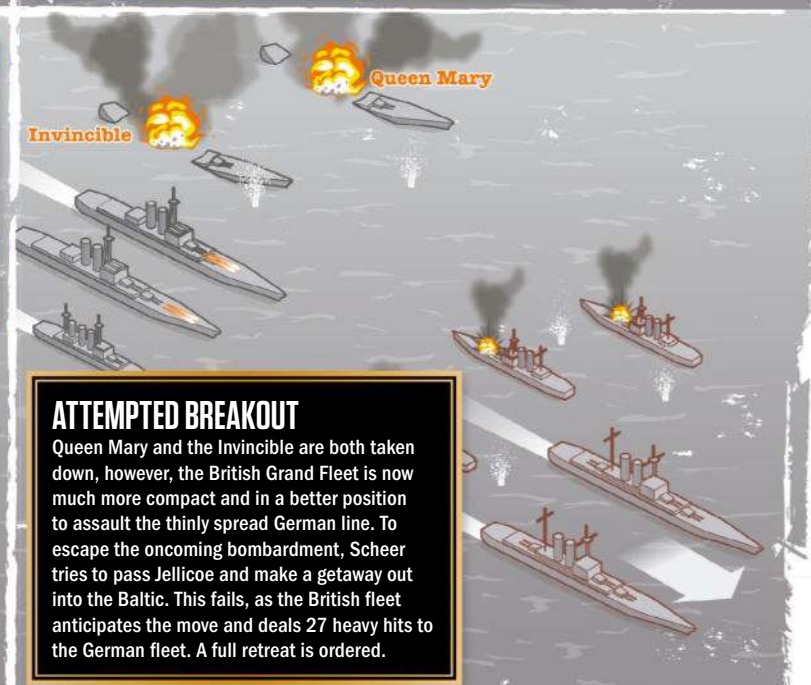
CRITICAL EARLY BLOWS

The first shots are fired by the Germans at 3.38 p.m.; the Lion, Princess Royal and Tiger are all struck badly. The Royal Navy responds, shelling the Von der Tann and the Moltke. The first major vessel to sink is the British battle cruiser Indefatigable as it loses all but two of its crew. Chester is ambushed by German light cruisers but is saved by a timely intervention from the 3rd Battlecruiser Squadron.



RUN TO THE NORTH

Beatty turns back to join up with the main British force, which looms into view through the haze. Hipper orders his fleet to sail north as Admiral John Jellicoe's main battle fleet enters the fray. Jellicoe heads south, cutting the Germans off before they are aware of the British trap. As the fleets clash, the Lutzow is sunk and the Seydlitz and Derfflinger are badly damaged as the loss of the Indefatigable is avenged.



ATTEMPTED BREAKOUT

Queen Mary and the Invincible are both taken down, however, the British Grand Fleet is now much more compact and in a better position to assault the thinly spread German line. To escape the oncoming bombardment, Scheer tries to pass Jellicoe and make a getaway out into the Baltic. This fails, as the British fleet anticipates the move and deals 27 heavy hits to the German fleet. A full retreat is ordered.



TACTICAL RETREAT

An expert manoeuvre by Scheer ensures the lighter ships in the fleet cover the withdrawal of the Imperial German Navy's best vessels, which are now out of range of the Royal Navy's guns. As deteriorating light makes combat difficult, the battle begins to wind down.



AN UNSATISFACTORY END

Scheer turns back to face the British once again, but the threat of a submarine attack dissuades Jellicoe from finishing the Germans off. Through the night there are small skirmishes between light cruisers and destroyers. Jutland ends inconclusively as both navies return to their home ports of Wilhelmshaven and Scapa Flow.

Jutland was critical to the continuation of British naval supremacy and was perhaps more crucial to the outcome of the war than many give it credit for

"THE BATTLE OF JUTLAND WAS WON BY THE BRITISH LONG BEFORE THE WAR STARTED, BECAUSE THEY SIMPLY HAD MORE SHIPS"

WHEN BATTLESHIPS RULED THE WAVES



NICK HEWITT, THE HEAD OF HERITAGE DEVELOPMENT AT THE NATIONAL MUSEUM OF THE ROYAL NAVY, EXPLAINS HOW THIS CLASS OF SHIP CAME TO DOMINATE THE SEAS

WHICH WERE THE LEADING WARSHIPS ON THE SEAS PRIOR TO THE DREADNOUGHT?

Armoured turreted battleships were still the dominant warships and the currency by which nations measured their worth, much like nuclear weapons today. These ships have now misleadingly become known as 'pre-dreadnoughts', but actually this is a little simplistic. The dreadnought was not a wholly new ship but a dramatic improvement on what went before.

WHAT WAS THE DREADNOUGHT CLASS' DEFINING FEATURE?

Dreadnoughts had two major innovations that set them ahead of their predecessors. Turbine engines gave them much greater speed, and they had a uniform main armament battery of 12-inch (30-centimetre) guns rather than a bewildering mix of weaponry. This meant that they were faster and better armed than any other battleship afloat.

WHEN DID THE NAVAL ARMS RACE BETWEEN THE BRITISH AND GERMAN EMPIRES BEGIN? WHO TRIGGERED IT?

It began with the First German Naval Law in 1898. The reasons are very complex, but essentially Kaiser Wilhelm II and Admiral Tirpitz believed that Germany should have a fleet in order to cement its reputation as a world power.

The Germans grossly underestimated the British response to any challenge to its maritime prowess, as it was what the country depended on for its very existence. In a nutshell, Britain needed supremacy on the seas, as without its global trading empire, it was nothing. German power came from its army, and the nation merely wanted sea power. Dreadnoughts essentially pressed the reset button; both countries had to start building these ships from a standing start, and ultimately the British were able to build a larger number of ships much more quickly. The Battle of Jutland was won by the British long before the conflict started, because they simply had more ships.

TO WHAT EXTENT DID THE OTHER MAJOR POWERS GET INVOLVED?

Most were building battleships and started building dreadnoughts. In fact, the Japanese and Americans laid down very similar ships at the same time but they did not build fleets of similar sizes. Battleships and later dreadnoughts were also built

for various South American countries, where a miniature arms race took place.

WHICH WERE THE BEST DESIGNS OF THE ERA?

In my opinion, the Royal Navy's Queen Elizabeth-class super-dreadnoughts were the finest examples of their type, and all five ships went on to serve with distinction right through World War II as well.

HOW DID THE COUNTRIES FINANCE THIS MASSIVE ARMS RACE?

The building was financed through taxation. Britain was the world's only superpower at the time and could comfortably afford it. Readers will probably be surprised by the enormous popular support this massive increase in defence spending generated, as exemplified by the popular slogan 'we want eight and we won't wait', calling for the construction of more dreadnoughts.

HOW DID THE NEW TECHNOLOGY FARE IN THE BATTLE OF JUTLAND AND THE WAR AS A WHOLE?

Dreadnoughts performed well at Jutland and elsewhere; in fact, only one British dreadnought battleship was lost in action during World War I, HMS Audacious, which was mined. Jackie Fisher's other iconic design, the fast, well-armed but thinly armoured battle cruisers, fared less well, with three of them blowing up and sinking at Jutland with catastrophic loss of life.

HOW DID THE ROYAL NAVY ENFORCE ITS BLOCKADE ON GERMANY DURING WORLD WAR I?

Because of new weapons – notably torpedo boats, submarines and mines – the Royal Navy could no longer enforce a close blockade outside enemy ports, as they had against the French in the Napoleonic period.

Instead, they maintained a 'distant blockade' from Scapa Flow in the Orkneys, which gave the Germans access to the North Sea but still prevented them from trading. The German fleet was essentially under house arrest.

IF THE GERMANS HAD WON THE BATTLE OF JUTLAND OUTRIGHT, HOW COULD THIS HAVE CHANGED THE OUTCOME OF THE WAR?

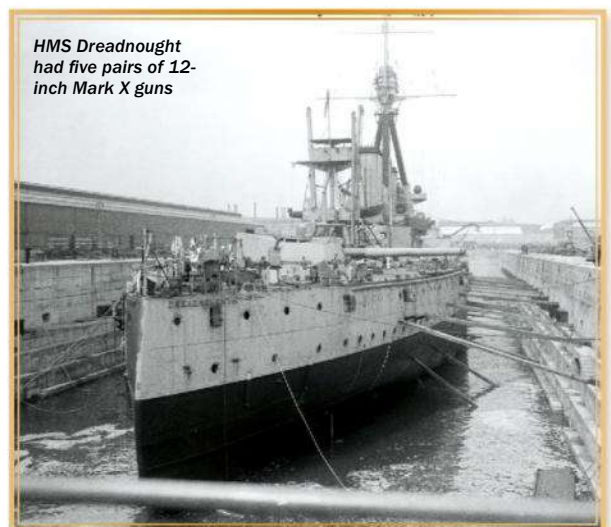
I believe Jutland was unwinnable for the Germans, but if they had won it, they could have broken the British blockade and certainly prolonged (or maybe even have won) the war. Jutland was the forgotten battle that shaped the course of World War I.

HOW LONG WERE SUPER-DREADNOUGHTS IN PRODUCTION UNTIL THEIR DESIGN WAS SURPASSED?

Super-dreadnoughts were gradually superseded by more modern battleship designs in the 1930s and 1940s, up to the end of World War II. However, the last World War I-era super-dreadnoughts continued to serve in the British, American, French, Italian and Japanese navies until the end of World War II.

WAS THERE ANY SORT OF ANGLO-GERMAN NAVAL ARMS RACE IN THE LEAD UP TO WORLD WAR II?

Although the Nazis began to build new warships and the British responded to that, it was not really an arms race, as the Germans could never catch up. The Third Reich never took naval re-armament as seriously as they did the redevelopment of the army. Germany began World War II with a far smaller fleet, although unit for unit, some of their ships were more modern and effective.



HMS Dreadnought had five pairs of 12-inch Mark X guns

WAR ON THE WAVES

After years of supremacy at sea, Dönitz's wolf pack faced a new threat from the Allies' air forces



"A STORM HAD WHIPPED UP THAT WAS SO FEROCIOUS THAT THE CONVOY, WITH DWINDLING FUEL, WAS FORCED TO KEEP STEAMING ALONG THE DOOMED COURSE FATE HAD SELECTED FOR IT – DIRECTLY INTO THE U-BOATS' KILLING GROUND"



SUB HUNTERS

IF THE ALLIES WERE GOING TO WIN THE FIGHT TO CONTROL THE ATLANTIC THEY WOULD HAVE TO FIND A WAY TO DEFEAT THEIR MOST DANGEROUS ENEMY AT SEA: U-BOATS

WORDS NICK SOLDINGER

The Anglo-Canadian convoy SC 42 left Nova Scotia bound for England on 30 August 1941. It consisted of more than 60 slow-moving merchant ships protected by four warships from the Royal Canadian Navy. Ahead of it lay 4,500 kilometres of wild ocean, temperatures cold enough to freeze the sea spray to the ships' handrails, and waves the size of tower blocks.

The crossing, which would take the ships a minimum of two and half weeks to complete, held a far deadlier threat than anything the environment could throw at them, however. Shortly after leaving port, the lumbering fleet got word from British intelligence that a vast wolf pack of German U-boats was prowling off the coast of Greenland. Ordinarily, such information would have allowed the convoy to reroute and avoid the waiting menace – but not this time.

A storm had whipped up that was so ferocious that the convoy, with dwindling fuel, was forced to keep steaming along the doomed course fate had selected for it – directly into the U-boats' killing ground.

By now Britain had been at war with Nazi Germany for two years. Isolated from the rest of Europe for much of that time and blockaded by the German navy, it had relied on its ally Canada to keep it alive – literally. When Hitler's plan to invade Britain in 1940 faltered in the wake of the Battle of Britain, he switched tactics – if the island was a fortress, then he'd besiege it. Blitzed from the air and starved of supplies from the sea, the country was by this time nearing exhaustion. It was desperate for the supplies SC 42 was bringing. Much of it however, tragically never finished the journey.

The man Hitler had chosen to choke off Britain's food supply was Admiral Karl Dönitz.

A veteran U-boat commander from World War I, he was a brilliant tactician, ruthless in battle and respected by his men. It was his controlling nature over the U-boat fleet, however, that would cost him what would come to be known as the Battle of the Atlantic.

In the autumn of 1941, it was a weakness that had yet to manifest itself in the outcome of this war under the waves; Dönitz was apparently winning the struggle. His U-boats were sinking nearly 150,000 tons of Allied shipping a month, and Convoy SC 42 was about to significantly add to that tally when, ten days into the crossing, it blundered into the jaws of the lurking wolf pack.

In the early hours of 9 September, the U-boats attacked their first merchant ship. Surfacing under cover of darkness to both keep pace with the convoy and avoid detection by the underwater sonar devices on the warships, the British freighter *Empire Springbuck* was the first to be picked off – all 39 of its crew were lost. When night fell the following evening, the U-boats struck again. Next to go was SS *Muneric*, with the loss of all 63 crewmen.

Hours later, another ship, the SS *Baron Pentland*, was damaged and abandoned by its crew. Within three hours, three more ships were destroyed. This continued for eight long days and nights. By the time SC 42 escaped the clutches of Dönitz's cut-throats, 16 ships had been sunk with the loss of more than 200 lives and thousands of tons of vital supplies. Back at his HQ in Brittany, where Dönitz had orchestrated the killings using charts and encrypted radio signals, these horrendous losses were toasted with fine local wines.

Little was the Nazi admiral to know, however, that this was the last time his hunters would enjoy such overwhelming success.

THE WAR UNDER THE WAVES

INCREASINGLY SOPHISTICATED TECHNOLOGY PLAYED A KEY ROLE IN DETERMINING WHO EMERGED VICTORIOUS FROM THE DEADLY DUEL ON THE HIGH SEAS

Perhaps more than any battle in history, the one for control of the Atlantic shipping lanes during World War II demonstrated the importance of technology in warfare. Since humans first began engaging in organised conflict thousands of years ago, the victors have almost exclusively been those with the technological edge. When World War II began, it was the German navy, which had been preparing for war for years and who in Admiral Dönitz had a master strategist, that looked best prepared for victory. However, Britain, along with its ally Canada and later the US, developed an astonishingly rapid and sophisticated response to the U-boat threat that ultimately proved irresistible.

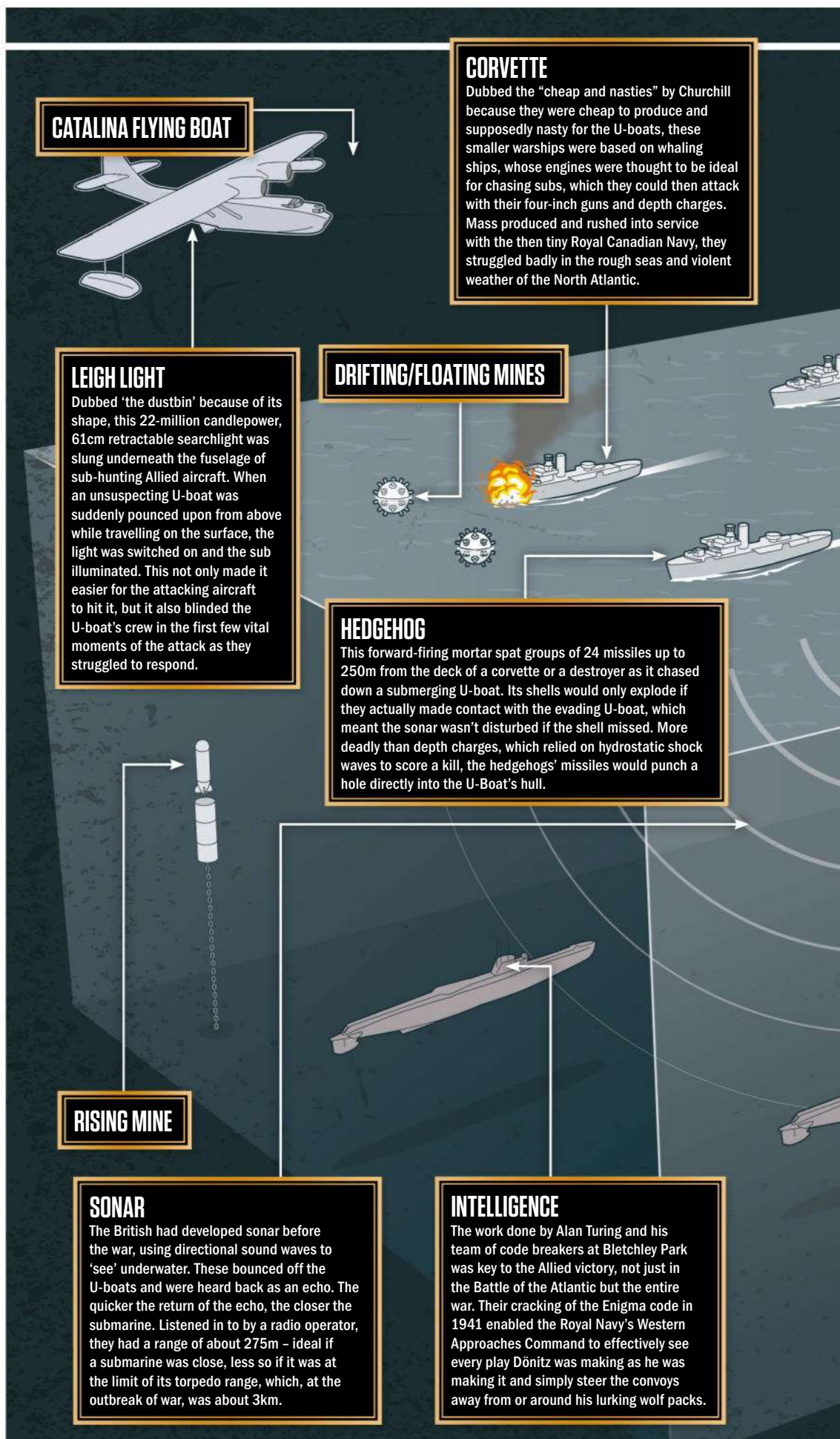
Dönitz insisted on a top-down command structure, ensuring he micro-managed every single engagement with Allied shipping from his war room, which from the summer of 1940 was in Lorient, western France. This obsessive planning ultimately made his submarine crews vulnerable to intelligence leaks. With the cracking of Germany's supposedly unbreakable Enigma code in 1941, which Dönitz used to communicate with his U-boat commanders and move his wolf packs around his maritime maps, the fate of Germany's U-boat fleet was sealed. Then, with an array of groundbreaking detection devices and bespoke weaponry, it was eventually destroyed.



Above: Ramming U-boats was another tactic used by Allied naval commanders – often resulting in considerable damage to their own ships



Depth charges were fired off the side of Allied warships. The underwater explosions they created broke the U-boats' hulls with shock waves



THE CONVOY SYSTEM

This was the key way merchant ships making the hazardous trip across the North Atlantic organised themselves. Travelling in large groups, they were protected by 'outriders' from the Royal Navy, the Royal Canadian Navy and later the US Navy. Although there could be scores of ships in a convoy, because of shortages there were often just four warships accompanying them, which used a combination of sonar and radar to 'watch' for U-boats both above and below the waves.

B24 LIBERATOR



AIRCRAFT

Although aircraft were the U-boats' greatest adversary, early on in the war the Allies had no long-range planes capable of patrolling the entire North Atlantic. An area in the heart of the ocean known as the 'air gap' allowed the U-boats to hunt unhindered. As the war went on, however, planes such as the Consolidated PBY Catalina and bombers like the Consolidated B-24 Liberator were adapted so that they could fly longer distances.

FIDO TORPEDO

The US-built Mark 24 was a 310kg torpedo that used two acoustic transducers (or antennae) that reacted to sound so that it could literally home in on its target. Measuring 215cm long and 50cm wide, it was dropped from aircraft and then, powered by a five-horsepower electric motor, propelled towards its target at a speed of 12 knots (the top speed of Dönitz's U-boats while submerged was just ten knots) delivering a 40kg high-explosive warhead.

DESTROYER

The Royal Navy had about 180 destroyers when the war broke out. In the early stages of the conflict, these were the most effective weapon for defending convoys against submarine attacks. Fast-moving and more heavily armed than the U-boats, they also had shallow hulls, making them particularly difficult for U-boat commanders to torpedo them. By the end of the conflict a further 277 destroyers had been commissioned, while 153 had been sunk – but only 28 to submarines.

DEPTH CHARGES

As they struggled to keep up with convoys while submerged, the U-boats often attacked on the surface and at night when their slender shape was hard to detect with binoculars. Once engaged by a warship or an aircraft, however, they'd need to dive to survive. Underwater, they were vulnerable to depth-charge attacks from above. These timer-controlled, high-explosive charges were jettisoned into the water in patterns, often exploding simultaneously above and below the submarine, sandwiching it in a blast.

MOORED MINES

TORPEDO MINE

"SINCE HUMANS FIRST BEGAN ENGAGING IN ORGANISED CONFLICT THOUSANDS OF YEARS AGO, THE VICTORS HAVE ALMOST EXCLUSIVELY BEEN THOSE WITH THE TECHNOLOGICAL EDGE"

BIRDS OF PREY

HOW AIRCRAFT BECAME THE KEY WEAPON FOR THE ALLIES IN CONTAINING AND DESTROYING THE MENACE OF DÖNITZ'S WOLF PACKS

The British rightly realised that air power was the key to defeating the U-boat scourge. Within weeks of war breaking out, HMS *Courageous*, one of the Royal Navy's seven aircraft carriers, was despatched to the Atlantic to hunt for subs. It had 48 Fairey Swordfish torpedo planes onboard and an escort of four destroyers. *Courageous* was patrolling the seas off northwest Ireland when, on 17 September 1939, it was sunk by U-29 with the loss of more than 500 crew. It was a devastating blow for the Royal Navy, which responded by restricting its remaining six carriers to areas free of U-boat patrols.

This presented a real problem, because Allied aircraft at that stage of the war simply didn't have the range to cover what was effectively a huge battlefield. The air gap that

opened up in the heart of the Atlantic now became the wolf packs' chief hunting ground.

To counter this, the Allies established air bases on Iceland, Greenland and the Faroe Islands and set about trying to source aircraft that could close the gap further. Britain had considerable pre-war experience of the flying boat and their versatility proved useful during the early stages of the battle, but the ideal long-range maritime patrol aircraft needed to be based on a bomber design.

Unfortunately, such aircraft were hard to find, as the strategic aerial bombing of occupied Europe was, for much of the war, the only means Britain and the Allies had of hitting back at the Germans, and the necessary aircraft could not be diverted. The answer came in the Consolidated B24 Liberator.

Unlike modern submarines, the German U-boats were not designed to spend weeks under the water. Rather, they were viewed as torpedo boats that had the capability of diving as a defensive strategy, and once submerged they were reliant on battery power to propel themselves. These batteries needed regular recharging – something that could only be done by the boat's diesel motors acting as a dynamo when the vessel was on the surface.

In the early stages of the war, the U-boats could prowl around on the surface in the air gap pretty much untroubled. By 1942, however, once the Liberator had been fitted with both radar and Leigh Lights and adapted to fly for longer, it was used, in conjunction with Dönitz's intercepted and decrypted communications, to shut the air gap for good.

"B-24 LIBERATORS MANAGED TO SINK MORE THAN 70 U-BOATS DURING THE BATTLE OF THE ATLANTIC"

SHORT SUNDERLAND

OPERATOR: RAF Coastal Command, Royal Canadian Air Force
IN SERVICE: 1938–59 **RANGE:** 2,848km

With a crew of 11, equipped with Air-to-Surface Vessel radar (ASV), and armed with eight depth charges and as many as 16 .303 Browning machine guns, the Short Sunderland was used to provide top cover for merchant convoys, patrol harbour approaches and hunt down Dönitz's wolf packs. This they did with huge success – some 60 U-boats were destroyed during the war by this particular aircraft. They were also used to pick up survivors of torpedoed ships despite not being designed to land on rough open sea. This heroic yet dangerous practice was eventually outlawed by RAF Coastal Command in 1942.

A Short Sunderland prepares for take off



CONSOLIDATED PBY CATALINA

OPERATOR: RAF Coastal Command, Royal Canadian Air Force, US Navy
IN SERVICE: 1936–57 **RANGE:** 4,000km

Armed with five .50-calibre machine guns – including two waist gunners in the plane's distinctive 'blister' pods on its sides – and capable of carrying as much as 1,800 kilograms on its wings' bomb racks, this beast of a machine was crewed by ten men. Like the Sunderland, it was also equipped with ASV and undertook sub-hunting duties as well as convoy-protection missions. This ubiquitous plane managed to destroy 40 U-boats during the Battle of the Atlantic, with two Catalina pilots – Flying Officer John Cruickshank of the RAF and Flight Lieutenant David Hornell of the RCAF – winning Victoria Crosses in the process.

Catalina Z2147 was credited with nine successful U-boat attacks during its service



CONSOLIDATED B-24 LIBERATOR

OPERATOR: RAF Coastal Command, Royal Canadian Air Force, United States Army Air Force, US Navy
IN SERVICE: 1939–57 **RANGE:** 3,220km

Produced in greater numbers than any other US bomber during World War II, the Consolidated B-24 Liberator was the key aerial weapon in the war against Dönitz's wolf packs. Crewed by ten men, once fitted with long-range fuel tanks from 1942 onwards it could stay airborne for up to 18 hours at a time. Armed with ten 12.7mm machine guns and equipped with ASV and the Leigh Light, it would attack with a formidable arsenal of weapons including torpedoes, bullets, bombs, rockets and depth charges. In all, B-24 Liberators managed to sink more than 70 U-boats during the Battle of the Atlantic.

Almost 19,000 Liberators were produced during its life span

**"THE AIR GAP THAT OPENED UP
IN THE HEART OF THE ATLANTIC
NOW BECAME THE WOLF PACKS'
CHIEF HUNTING GROUND"**



*German submarine
U-134 is attacked
from the air*

DEFENDING BRITAIN'S COAST

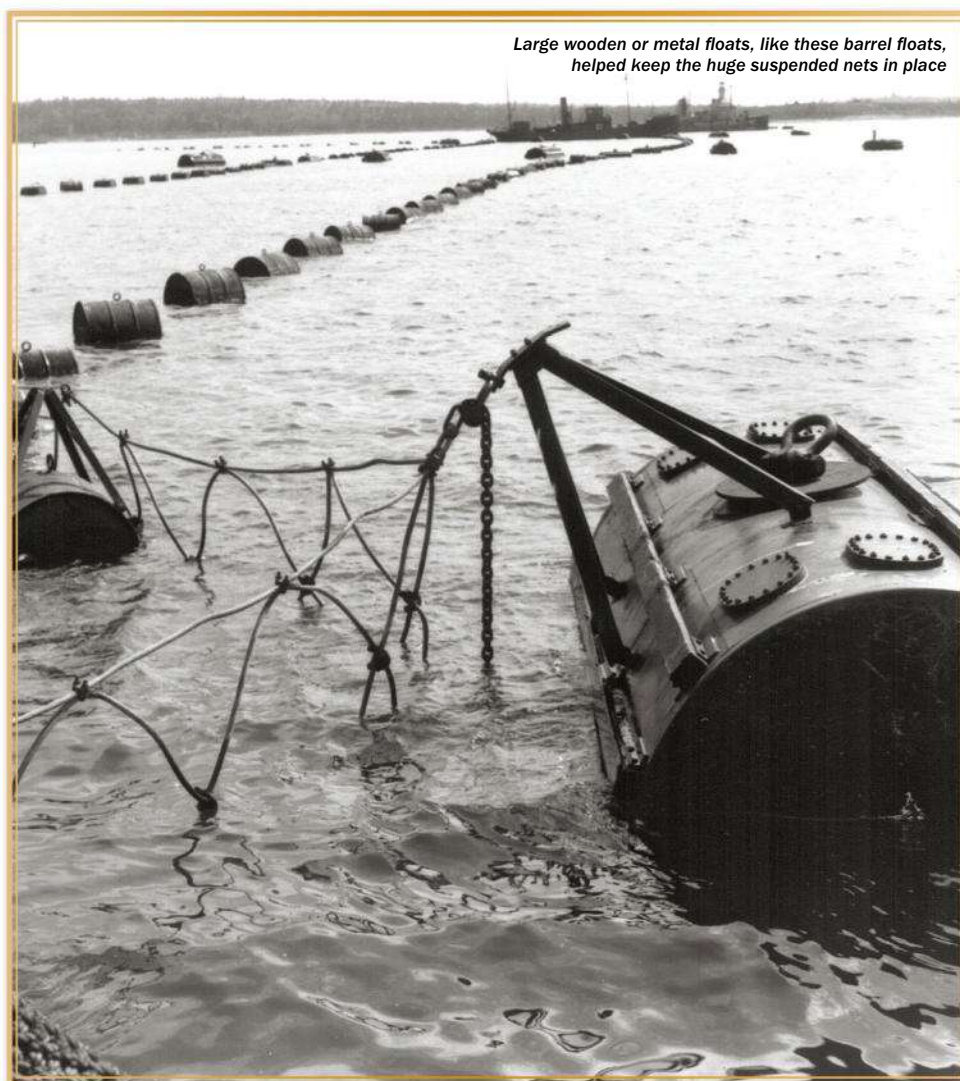
THE SYSTEM IMPLEMENTED TO KEEP U-BOATS OUT OF BRITISH PORTS WAS BOTH INGENUOUS AND COMPLEX

Britain's ports played a pivotal role in protecting the Atlantic convoys. After all, these were where the ships that confronted the U-boats sailed to and from, so it was little wonder that this might make them highly valuable targets for U-boat attacks themselves.

The British had actually been aware of this possibility long before hostilities broke out. Indeed, some of the technology the British would use – such as steel anti-submarine netting known as indicator nets draped across harbour entrances – had proved their worth in World War I when a number of German U-boats became ensnared in them and were subsequently sunk with depth charges. In fact, preparations were being made for a revival of the defence around Britain's more important ports as early as 1938.

Work readying the Clyde Estuary for war, for example, was started in the wake of the notorious Munich Conference, which British PM Chamberlain had returned from promising the British people that war with Hitler had been averted. It hadn't, of course, and when hostilities broke out less than a year later, a huge steel indicator net had already been

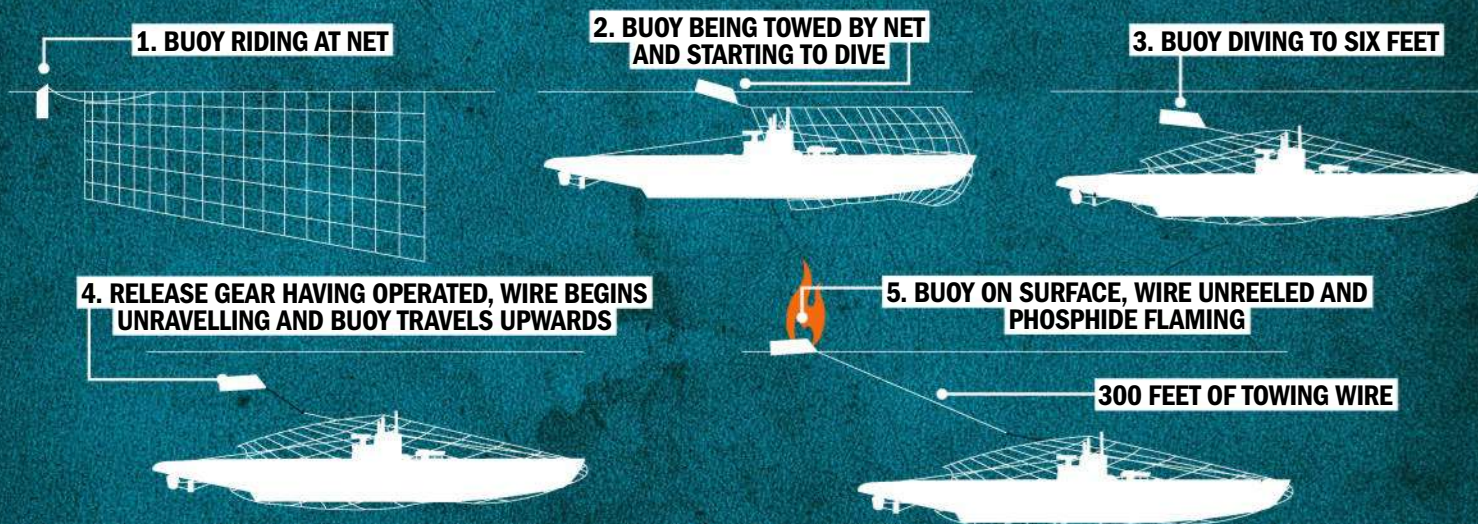
“PREPARATIONS WERE BEING MADE FOR A REVIVAL OF THE DEFENCE AROUND BRITAIN'S MORE IMPORTANT PORTS AS EARLY AS 1938”



Large wooden or metal floats, like these barrel floats, helped keep the huge suspended nets in place

PRAM INDICATOR BUOY WITH HYDROSTATIC RELEASE

WHEN A U-BOAT BECAME ENSNARED IN AN INDICATOR NET, THE BURNING BUOY GAVE AWAY THE ENEMY BELOW

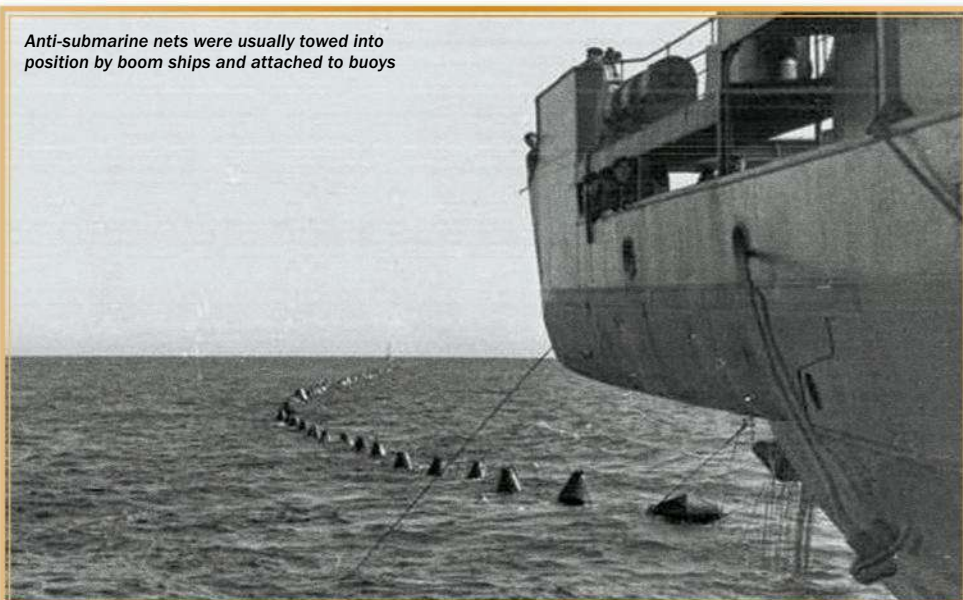


manufactured that was swiftly hauled into position by eight boom ships to seal off the Clyde from U-boats.

Elsewhere around Britain's coastline, and indeed across its empire, these indicator nets – which could be as long as 100 metres and as deep as the sea bed they were suspended over – and an increasingly complex series of defences would play their part in keeping the U-boats out.

The nets, which had a series of rocket flares attached to them that would go off if a submarine tried to breach the defences, were also sometimes attached to converted fishing boats armed with machine guns and depth charges. Other methods of defence around British harbours could include extensive minefields, sonar listening posts, radar stations, land-based gun emplacements, patrol ships, outpost observation ships, and of course regular sorties by aircraft from the RAF's Coastal Command. In combination, they proved a highly effective deterrent to Dönitz's U-boats.

Anti-submarine nets were usually towed into position by boom ships and attached to buoys



THE GREATEST DISCOVERY OF THE WAR

WHEN ONE BRITISH OFFICER BOARDED AN ABANDONED U-BOAT, LITTLE DID HE KNOW HE WOULD MAKE A HISTORY-CHANGING FIND

On 9 May 1941, U-boat ace Fritz-Julius Lemp, commander of U-110, attacked a convoy south of Iceland. He hit two ships before being spotted by the British destroyer HMS Bulldog, which raced towards him. Lemp, realising the danger, dived, but it was too late. The Bulldog was soon on top of him, and he and his crew could hear depth charges crashing into the water.

Lemp's crew knew what was coming and waited in agonising silence for the inevitable shock waves from the explosions. When they came, they were horrific. "The vibrations were so bad," Georg Högel, Lemp's then 21-year-old radio operator, later recalled, "that we knew we couldn't escape. Lemp then gave the order to surface." As U-110 made its way up from the ocean floor to surrender, HMS Bulldog fired on

it with every weapon it had. So intense was the fire that rained down upon it that when it surfaced U-110's terrified crew poured from its hatches and leapt into the sea.

"Lemp stood on the conning tower shouting, 'Get out, everybody get out!,' Högel remembered. "Us two radio operators were down in the control room so we called out, 'What about the secret machines?' [Lemp replied,] 'Leave everything in there, get out!' He just wanted to save every man."

Lemp was killed in the confusion as his crew abandoned U-110 believing that it was sinking. Somehow, though, the submarine stayed afloat. On HMS Bulldog, 20-year-old Sub-Lieutenant David Balme was then given the nod by his commander to lead a boarding party. "We rowed over," Balme recalled years later. "I got out and walked along the deck with my revolver pointing. All the hatches were open but you didn't know how many Germans might still be down below. That was the frightening thing because you needed both hands to go down those ladders. So I holster my revolver and gradually go down, and there I was in the control room. Absolutely silent, no Germans, just me. So I called my boarding party down and we started searching the U-boat."

What happened next was one of World War II's most significant events. As Balme's men searched the abandoned submarine they found not only the U-boat's codebook but an intact Enigma machine – the secretive device used to encrypt and decrypt German radio signals. The machines were raced back to the British code-breaking centre at Bletchley Park in Buckinghamshire, where some of Britain's best minds had been struggling to crack Enigma's riddle. The machine, a more up-to-date version of the pre-war one they had been working with, swiftly provided a breakthrough.

Using it, Bletchley's star code breaker Alan Turing identified a pattern in the first communiqués being intercepted each day between U-boat commanders and Dönitz. Realising that these messages were weather reports, he slowly began to unravel Enigma, eventually developing the Turing bombe – a huge proto-computer capable of working through thousands of code variations simultaneously – to crack it. The chance capture of Lemp's Enigma machine became one the greatest pieces of good fortune in the history of warfare.

Below: The discovery of the newer Enigma machine helped code breakers break the cipher



"AS BALME'S MEN SEARCHED THE ABANDONED SUBMARINE, THEY FOUND NOT ONLY THE U-BOAT'S CODEBOOK BUT AN INTACT ENIGMA MACHINE"



The destroyer HMS Bulldog gave U-110 such a pounding that its submerged crew believed it was sinking. It wasn't and the vessel was captured

MiDWAY

THE BATTLE THAT TURNED THE WAR IN THE PACIFIC

WORDS JAMES HOLLAND



Source: WPA / PD Gov



Source: WPA / PD Gov



Source: WPA / PD Gov

“IN THOSE SEVEN MINUTES EVERYTHING CHANGED IN WHAT WAS REALLY THE AMERICAN TRAFALGAR AND WHICH SAW THE IMPERIAL JAPANESE FLEET ANNIHILATED”

At 10.20 a.m. on the morning of 4 June 1942, the US was losing the war in the Pacific. By 10.27 a.m., it was winning.

In those seven minutes everything changed in what was really the American Trafalgar and which saw the Imperial Japanese Fleet annihilated in a spectacular confrontation that was dramatically unexpected. It's an incredible story, and it's no wonder it became the subject of a movie in 2019.

When the Japanese entered the war with their assault on Pearl Harbor in Hawaii on the morning of 7 December 1941, it's important to understand what it was they were trying to achieve. There was certainly no grand plan to conquer the United States and take over the White House. Rather, it was about creating time; the idea was to cripple the US in a dramatic single strike to buy them perhaps six months or more – time in which they would conquer the resource base they would need to continue their war in China. By the 1930s, Japan was rapidly modernising, and yet it did not have the resources to support this growth. China, on the other hand, most certainly did, and so its increasingly nationalistic and militaristic leadership invaded in 1937. It did not all go to plan, however, and they soon became bogged down in an attritional conflict that quickly began to cost them a lot more than they were gaining.

All around southeast Asia, however, were all the resources they needed, but these territories were owned by the British, the Dutch and the Americans. Already, in 1940, following the fall of France to the Germans, the Japanese moved into French Indochina (now Vietnam), a strike that greatly unsettled the Western powers. Most of Japan's oil and steel was provided by the US, who responded to

Japanese aggression by making it far harder for them to continue buying these essential goods. This put Japan in a difficult position. Either they had to back down, pull out of Indochina and even China with the loss of face and economic catastrophe that would entail, or come up with an alternative plan to get them out of the mire. When Prime Minister Konoe resigned in November 1941 and Hideki Tojo took over, the die was cast. Tojo was an ultra-nationalist and hawk who believed that for all America's might and wealth, culturally, the US did not have the stomach for a fight. The Japanese might have been materially weak, but they did have a modern, highly trained navy. Mentally and psychologically, they also believed they were superior. And so the idea of a strike on Pearl Harbor was born – a daring attack that would knock out the US Pacific Fleet in one blow and buy them precious time.

The attack on Pearl Harbor was the idea of Admiral Isoroku Yamamoto, a highly cultured man who had studied in the US and who was opposed to Japan going to war. However, he believed this gambler's throw of the dice was the only way in which Japan could solve the conundrum in which it found itself. It was daring, it was bold, but it was also flawed because back on 27 November 1941, Admiral Husband Kimmel, commander-in-chief of the Pacific Fleet on Hawaii, was warned by Washington that war with Japan loomed. Kimmel responded by sending two of his four aircraft carriers out of Pearl Harbor to the Pacific outposts of Midway and Wake, two small atolls turned into military bases. A third carrier was undergoing a refit and the fourth was serving in the Atlantic.

The Japanese attacking Pearl Harbor caused untold damage: 353 aircraft operating from

Main image: A still from the movie Midway, which is available on Digital Download, 4K Ultra HD, Blu-ray and DVD

Inset, left to right: US Navy pilots that flew the torpedo attack mission against the Japanese fleet's Midway Occupation Force during the night of 3-4 June 1942

Aerial photograph of Midway Atoll, 24 November 1941

US Navy Admiral Chester W. Nimitz, Commander-in-Chief Pacific Fleet

© Lionsgate



USS Yorktown is hit by a Japanese aerial torpedo during the mid-afternoon attack in the Battle of Midway, 4 June, 1942

Source: Wiki / PD Gov

WAR ON THE WAVES

their own carriers achieved total surprise, their torpedo bombers crippling the US Pacific Fleet while dive-bombers hammered the island's airfield. Within minutes all eight battleships had been hit. A further 171 aircraft in the second wave roared in to attack a short while later, so that where once there had been 'Battleship Row' there was now a mass of twisted metal, angry flames and billowing, thick smoke. And a lot of dead American servicemen. On the airfields, 188 aircraft were destroyed and a further 159 damaged. Also hit were three cruisers, three destroyers and three other vessels.

Witnesses were stunned by how low the Japanese pilots flew. "Hell, I could even see the gold in their teeth," observed one army officer. "It was like being engulfed in a great flood, a tornado or earthquake," said another. "The thing hit so quickly and so powerfully it left you stunned and amazed."

Pearl Harbor was seen as a terrific success in Japan, although not by Yamamoto, who was hugely disappointed. He understood that a

shift had taken place in naval warfare – that battleships were no longer the pre-eminent warship but rather, that mantle had been passed to aircraft carriers, and for all Pearl Harbor's success, not one American carrier had been hit. Yamamoto understood that his navy simply had to destroy those carriers, and so immediately began planning how he might get them, and Midway, he believed, held the key. He would not target the tiny Midway atoll for invasion, but rather, use it as bait. By threatening this vital US base, the Americans, he hoped, would be forced to defend it and send their carriers. And when they did, his superior force would pounce and destroy them.

First, though, the Japanese Army, supported by the Navy, had to consolidate its own position in the Pacific and Southeast Asia. Malaya, Singapore, the Dutch East Indies, Burma and the US Philippines were all overrun in an astonishing series of rapid and extremely violent strikes. The ABDA command (American, British, Dutch and Australian) was both under-

prepared and caught off guard and had no answer, but while the Japanese might have appeared unstoppable, the threat from the rapidly growing US armed forces, and especially its navy, had in no way gone away.

Meanwhile, the US was also planning how to strike back. American strategy in the Pacific was led by Admiral Ernest King, the head of the US Navy. His approach was clear and based around two fundamental factors: first, Hawaii could not be allowed to fall, and second, nor could Australia. He ordered Admiral Chester Nimitz, who had replaced Kimmel, to make his first priority to secure the seaways between Hawaii and the island of Midway, just to the east of the international dateline, and the North American mainland. His second priority was to make safe the routes to Australia. Fiji and the Samoan and Tonga Islands needed to be made secure as crucial strong points along the way, and from these bases a counter-offensive could be then launched up through the Solomons,



The pilots of the US Marine Corps scout bomber squadron VMSB-241

A US Navy Grumman F4F-3 in early 1942



Source: Wiki / PD Gov



New Guinea, Borneo and then, in time, the Philippines. It was the correct strategy.

On 1 February, the US Navy's fightback got underway with a series of raids on shipping and airfields on the Japanese-held Marshall Islands. Although the material damage was less than had at first been thought, it had taught the Americans vital lessons and got the fightback underway.

In April 1942, they launched the Doolittle Raid, flying sixteen B-25 bombers from the carrier USS Hornet and bombing ten different targets on Japan, including Tokyo. While the physical damage was small, the psychological impact was huge as it made the Japanese realise they were not impervious to attack themselves. It also ensured the Japanese Army, which was a ferocious rival of the Navy, now agreed to support Yamamoto's plan to lure the Americans at Midway.

Further US carrier raids were mounted but the first major naval clash came in May 1942. The Japanese now wanted to disrupt Allied

**“WHILE THE PHYSICAL
DAMAGE WAS SMALL, THE
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plans by invading and occupying Port Moresby in New Guinea, to the north of Australia, and also the island of Tulagi in the Solomons. Crucially, American cryptanalysts had broken Japanese codes, however, and learning of the plan, a joint US-Australian naval force of carriers and cruisers was sent to intercept and stop the enemy's plans. Tulagi was invaded on 3-4 May, but the Japanese had been surprised to come under attack by American aircraft from

the carrier Yorktown. They now advanced to meet the Allied naval forces, clashing in the Coral Sea on 7 May.

This was the first battle in which aircraft carriers engaged one another, and both the Americans and Japanese lost one each and suffered damage to the others. On 8 May, US radar screens picked up enemy aircraft heading towards USS Lexington and Task Force 17, and her Wildcat fighters were scrambled to meet them. Then, at 11.13 a.m., lookouts spotted the black dots of enemy aircraft. As they approached, the attacking torpedo bombers split into two groups while enemy dive-bombers peeled over and down towards the Lexington, which was now frantically taking swerving evasive action. The enemy planes met a wall of anti-aircraft fire as well as the Wildcats. “It seemed impossible we could survive our bombing and torpedo runs,” said Lieutenant Commander Shigekazu Shimazaki, the Japanese attack commander. “Our Zeroes and enemy Wildcats spun, dove, and climbed in the

US Navy aircraft carrier USS Yorktown shortly after it was hit by Japanese bombs on 4 June 1942



WAR ON THE WAVES

midst of our formations. Burning and shattered planes of both sides plunged from the skies.”

Despite the heroic defence, Lexington was hit by both bombs and torpedoes, but amazingly, fire-damage parties managed to restore her to sea-going order before a series of explosions ensured the mighty carrier would have to be abandoned and scuttled. With both sides suffering heavy losses of aircraft as well as ships, the battle ended as dusk fell on the second day of battle. Crucially, the Battle of the Coral Sea ensured the Japanese abandoned their plans to invade New Guinea.

Admiral Yamamoto is rightly feted as an inspirational and enlightened commander, but his plan for Midway was too complicated at a time when it did not need to be. At this stage of the war, they had both quantitative and qualitative superiority over the Americans: their torpedo bombers were better, their pilots better trained and they had more warships than the Americans. It would not last, as Yamamoto was well aware, which was why Midway presented a golden opportunity to set the US Navy back not just six months but potentially much longer.

In the intervening time, the Japanese could further extend their defensive ring. With luck, Yamamoto hoped the Americans would then sue for peace and the Japanese would be left alone, now resource-rich and able to finish a victorious war with China.

His plan was to entice the US Pacific Fleet into battle by separating his forces, with his carriers and battleships several hundred miles apart. The plan was to attack the enemy carriers and then follow up with his battleships and cruisers, who would then engage whatever American ships remained.

Just as Japanese intelligence was poor, however, US intelligence was excellent. American code-breakers had intercepted and cracked enough Japanese naval signal traffic to give them a picture of what the enemy was up to. It was Admiral Nimitz's responsibility to interpret this intelligence picture and work out what to do about it. He knew the Japanese had four or five carriers and that he had three. On the other hand, he could use the airfield of Midway as an unsinkable carrier, which potentially evened it up. Even

so, his decision to take on the Japanese was a huge one and massive risk, albeit a carefully calculated one.

It was perhaps more so because his main carrier task force admiral, Bill Halsey, was ill, which left him short of a carrier commander. He filled the post with Admiral Ray Spruance, who was hugely competent but whose experience lay with commanding cruisers, not carriers. Spruance was appointed at the last minute and headed out to take command of Halsey's two carriers in what was unquestionably going to prove a decisive clash against the Japanese. Admiral Jack Fletcher was overall US commander at sea.

The clash began on 4 June with the Japanese sending the carrier air forces to attack Midway. Because they had no idea the Americans had cracked their codes, they had been expecting to catch the US air forces napping on the atoll, but in fact, the American bomber force had already taken off to attack the Japanese carriers. Yet the first American air strike on the Japanese carriers was a disaster. US naval air forces – a combination of heavy bombers and

US Navy Torpedo Squadron 6 and Douglas TBD-1 Devastator aircraft are prepared for launching aboard the aircraft carrier USS Enterprise



torpedo bombers – were arriving from Midway at different times rather than as a concentrated mass. Japanese naval fighters were scrambled and because of their superior skill and capabilities, picked them off with ease. The American torpedo bombers missed entirely and were largely slaughtered. Then the B-17 heavy bombers from Midway arrived, but were too high, too inaccurate, and although from 20,000 feet up the carriers below had disappeared behind huge fountains of water, not one had been hit.

At this point, the Japanese were unquestionably winning the battle and with it, the war in the Pacific. It was, though, now time for the US carriers to launch their strike force. Radio intelligence reaching the carriers suggested a location for two of the Japanese carriers but not the remaining pair. All three US carriers were now ordered to send in their own aircraft to attack the Japanese, but the commander of USS Hornet ordered his men to head in a different direction to look for the missing enemy carriers. It was a hunch, and, as it turned out, an entirely wrong one too. This meant that with the Midway air forces effectively destroyed, and Hornet's force

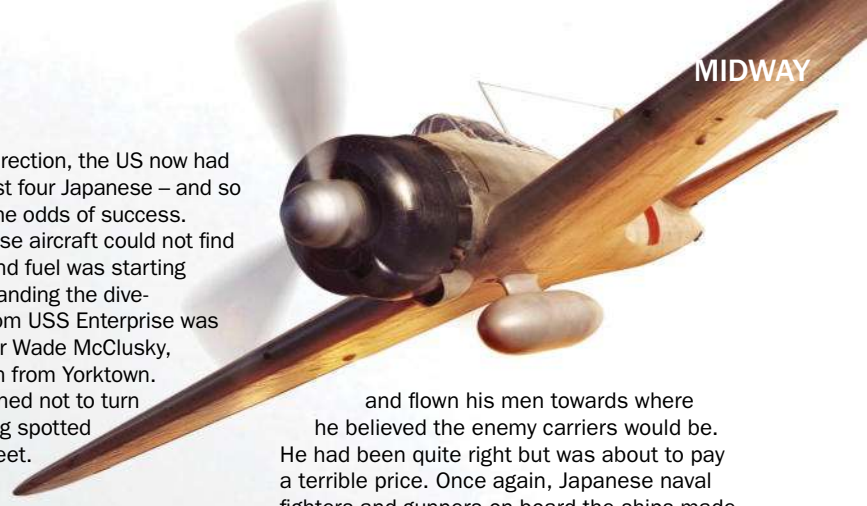
heading in the wrong direction, the US now had only two carriers against four Japanese – and so dramatically slashing the odds of success.

The trouble was, those aircraft could not find the Japanese either, and fuel was starting to get a bit low. Commanding the dive-bombing squadrons from USS Enterprise was Lieutenant Commander Wade McClusky, with a further squadron from Yorktown. McClusky was determined not to turn for home without having spotted the Japanese carrier fleet. His courage paid off because in the nick of time, he spotted the wake of a Japanese destroyer going at speed and realised it had to be trying to rejoin the main force. Ordering his men to head in the direction the destroyer was steaming, sure enough, at 10.22 a.m. they spotted the Japanese carriers. And there weren't two of them, but all four.

Ahead of McClusky's bombers, however, was one squadron of torpedo bombers from Hornet, commanded by Lieutenant-Commander Jack Waldron, who had disobeyed the orders

and flown his men towards where he believed the enemy carriers would be. He had been quite right but was about to pay a terrible price. Once again, Japanese naval fighters and gunners on board the ships made mincemeat of the American torpedo bombers, and all 15 were shot down; Waldron was among those killed.

Yet the sacrifice of the torpedo squadron gave a glimmer of hope to the bombers, because with the Japanese fighters focusing on the torpedo squadron as they attacked at low level, McClusky's 30 dive-bombers as well as the 15 from Yorktown were left alone. Despite anti-aircraft fire, dive-bombers now had a fairly clear run. The two squadrons from Enterprise





Japanese prisoners of war on board USS Ballard after being rescued from a lifeboat two weeks after the Battle of Midway

Source: Wiki / PD Gov

were ordered by McClusky to split into two and attack two of the Japanese carriers at the same time, but through a miscommunication, all 30 began diving towards Kaga. Realising the mistake, Lieutenant Dick Best and two of his wingmen, swung north to attack Akagi. Meanwhile, Kaga was struck between four and five times, with one bomb hitting near the bridge and killing the carrier's commander and senior officers.

A few minutes later, Best and his wingmen were diving on Akagi. Although only hit once, and by Best, it was a fatal strike as it penetrated the deck into the main hanger causing a massive explosion and fires. Another bomb had damaged the rudder.

Two aircraft carriers had been destroyed in a matter of minutes and now it was the turn of Yorktown's dive-bombers, commanded by Max Leslie, this time targeting Soryu, and hit it

three times. Three carriers had been stopped dead in the water, their aircraft destroyed and each one now a floating inferno. The fourth carrier managed to survive the onslaught and soon after launched a counter-attack, hitting and crippling Yorktown. Later that afternoon, however, after a scout plane from Yorktown located the final carrier, Hiryu, the dive-bombers of Enterprise took off again, found the fourth carrier, and hit the ship four or five times, including a second bomb from Dick Best.

The Japanese abandoned ship and then scuttled the Hiryu, although Rear Admiral Tamon Yamaguchi and the ship's captain, Tomeo Kaku, decided to remain on board and go down with the vessel. This act of seppuku robbed the Japanese of their best carrier commander.

Although the loss of Hiryu was a terrible further blow for the Japanese, in truth the battle, and arguably the entire Pacific War, had been won in those seven minutes between 10.20 a.m. and 10.27 a.m. It had been an astonishing victory by the Americans, who, without doubt, had begun the day as the underdogs. On that one June day, however, Japanese hopes of further consolidation in the Pacific were dashed for ever, their one chance to halt the Americans lost.

And just two years later, the US Navy attacked the Japanese island of Saipan with a staggering 24 carriers. Its moment of weakness had been in the initial six months of war, but at Midway, good fortune, brilliant intelligence and bare-faced courage had conspired with Japanese hubris to bring about surely the greatest victory at sea in American history. The Japanese failure at Midway was one for which they would pay dearly, a devastating setback from which they would never recover.



*A formation of Grumman TBF-1
Avenger anti-submarine torpedo
planes in flight over the Pacific*



Great Battles



BATTLE OF LEYTE GULF

THE US AND IMPERIAL JAPANESE NAVIES SQUARED OFF IN A SERIES OF ENGAGEMENTS THAT CAME TO COMPRISE ONE OF HISTORY'S LARGEST NAVAL BATTLES
LEYTE GULF, 23-26 OCTOBER 1944

WORDS MARC DESANTIS



On 20 October 1944, after a heavy naval bombardment, Supreme Allied Commander, Southwest Pacific Area, General Douglas MacArthur commenced landing 200,000 US troops on the island of Leyte with the goal of liberating the Philippines from Japanese occupation. Offshore, in Leyte Gulf, lay Vice Admiral Thomas Kinkaid's US Seventh Fleet covering the amphibious invasion force and delivering the ammunition, food and medical supplies necessary to sustain the troops heading inland.

The days before the landings saw major American carrier-plane airstrikes on Formosa and the Ryukyu Islands, and hundreds of Japanese aircraft fell victim to American fliers. Coupled with the devastating losses from the Battle of the Philippine Sea that June, the Japanese Combined Fleet would be largely without air cover for the upcoming battle.

In response to the American landings at Leyte, the Japanese high command initiated its Sho-Go 1 plan with the intention of destroying the US invasion fleet. This could not be achieved by Japan's very limited air power, so a Japanese surface fleet would have to do. It would first be necessary for the US Third Fleet under Admiral William 'Bull' Halsey to be lured away from its position to the northeast of

the Philippines so that it could not interfere with the Combined Fleet's attack on the US amphibious fleet in Leyte Gulf.

Sho-Go 1 was a complicated battle plan, in keeping with most Japanese naval operations of the war. It called for a 17-ship Northern Force departing from Japanese home waters under Vice-Admiral Jisaburo Ozawa and consisting of one fleet carrier and three light carriers, which were largely empty of airplanes, two battleships and 11 lesser warships to lure Halsey away. A powerful Centre Group under Vice-Admiral Takeo Kurita comprising five battleships, ten heavy cruisers, two light cruisers and 15 destroyers sailing from Borneo would traverse the middle of the Philippines through the San Bernardino Strait before making its way southward to the Leyte landing sites.

Lastly, the Southern Force, under Vice-Admiral Shoji Nishimura, consisting of two battleships, one heavy cruiser and four destroyers, would also sail from Borneo and be joined by another squadron from the Ryukyu Islands of two heavy cruisers, one light cruiser and seven destroyers under Vice-Admiral Kiyohide Shima. These groups, especially the Centre Group, which contained the 70,000-ton super battleships Yamato and Mushashi, were supposed to fall upon the US invasion fleet at

Leyte Gulf on 25 October and wipe it out with their big guns.

Oddly, neither the US nor Japanese fleets had overall commanders for their forces for the battle. The result was that there were instances of miscommunications and misunderstandings that had serious impacts on the course of the battle.

The Americans struck first when, early in the morning of 23 October, a pair of submarines, USS Darter and USS Dace, intercepted Kurita's Centre Group off Palawan Island and torpedoed three Japanese cruisers, sinking two and badly damaging a third. Darter ran aground during the fight and the crew was rescued by Dace.

Kurita's position was now known to the Americans. Halsey's Third Fleet had its core striking power in fast carriers of Task Force 38 plus several battleships. TF 38 comprised three smaller task groups, each built around several aircraft carriers, while a fourth was away at the fleet anchorage at Ulithi Atoll rearming and refuelling.

From his flagship, USS New Jersey, Halsey directed his three carrier task groups against Kurita's Centre Group. He also became aware of the approach of Nishimura's vanguard group of the Southern Force and that it was ultimately headed



The light carrier USS Princeton was hit by a single Japanese bomb and sunk in the Battle of the Sibuyan Sea

for Leyte Gulf, through the Surigao Strait. He presumed that Kinkaid's Seventh Fleet had more than enough firepower to fend off Nishimura but he could not confer directly with Kinkaid. MacArthur, Kinkaid's superior, had forbidden any direct contact between the two fleets so messages took a long time. Halsey also recalled the fourth task group from its voyage to Ulithi.

On 24 October, in the Battle of the Sibuyan Sea, Halsey's carrier planes struck Kurita's Centre Group ships, which had no fighter protection at all. Most of the American's attention was given to the super battleship *Musashi*, which was sunk after being hit with 17 bombs and 19 torpedoes, as well as enduring 16 destructive near misses. Kurita ordered a retreat away from San Bernardino Strait.

American losses were minimal. However, Third Fleet's pilots provided overly rosy reports of their attacks when they returned to their carriers and Halsey, accepting them at face value, came to the conclusion that Kurita was no longer a major threat. When a report of Ozawa's Northern Force location came, he decided to take the whole of Task Force 38, comprising the carrier units of Third Fleet, plus all of his battleships, north to demolish it. He thought that Seventh Fleet had enough firepower left to defend itself and the invasion

beaches, but this was predicated on the belief that Kurita's Centre Group had been hurt much worse than it had been. Crucially, Kinkaid never received clear notification that Halsey was taking his whole fleet away and continued to believe that some of it was guarding the San Bernardino Strait.

With the strongest elements of the US Navy now steaming north, Kurita turned his own fleet around and through the San Bernardino Strait. His Centre Group emerged in the early morning of 25 October to discover Seventh Fleet's Task Force 77.4 between it and the invasion fleet's transports. Task Force 77.4, under the command of Rear Admiral Thomas Sprague, was composed of three task units – Taffy 1, Taffy 2 and Taffy 3. Each was built around a clutch of escort carriers and some destroyers. Kinkaid's Seventh Fleet had been organised to provide air cover for the American

troops ashore, not fight a major engagement against the Imperial Japanese Combined Fleet, but that is what they had to do.

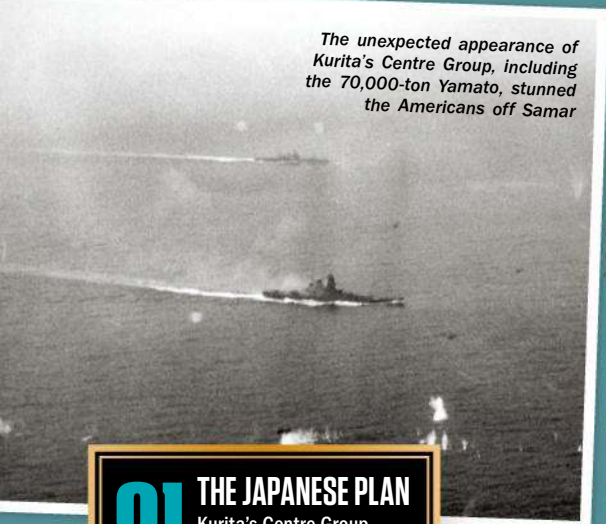
The outgunned and thoroughly surprised US Navy men of Taffy 3, under Rear Admiral Clifton Sprague, mounted a desperate defence, attacking the Japanese with their own carrier planes, dropping whatever bombs had been already loaded on them for close air support missions ashore and then strafing the enemy warships with the machine guns of their obsolescent Wildcat fighters. They were joined by their companion destroyers, which mounted near-suicidal attacks against the bigger Japanese ships. Taffy 1 and 2 were still far away but immediately sent help. For the time being, Taffy 3 was all alone.

The ferocity of the American response, with destroyers charging in to trade fire with tremendous

“MOST OF THE AMERICAN'S ATTENTION WAS GIVEN TO THE SUPER BATTLESHIP MUSASHI, WHICH WAS SUNK AFTER BEING HIT WITH 17 BOMBS AND 19 TORPEDOES”

BATTLE OF LEYTE GULF

Luzon Strait 23-26 OCTOBER 1944



The unexpected appearance of Kurita's Centre Group, including the 70,000-ton Yamato, stunned the Americans off Samar

01 THE JAPANESE PLAN

Kurita's Centre Group makes for the San Bernardino Strait heading for Leyte Gulf while Nishimura takes his fleet to the Surigao Strait, destination Leyte Gulf, where the US amphibious fleet lies offshore supporting the invasion forces. Ozawa's Northern Force steams south, intent upon luring away Halsey's Third Fleet.

02 BATTLE OF THE SIBUYAN SEA 24 OCTOBER 1944

On 23 October, US submarines Darter and Dace launch torpedoes against the ships of Kurita's Centre Group, sinking two Japanese cruisers. They also notify Halsey of Kurita's position. The next day, carrier planes from Halsey's Third Fleet attack Kurita's ships, sinking the battleship Musashi. Halsey now mistakenly believes Kurita's fleet is a spent, impotent force.

03 NORTHERN FORCE DECOY 24 OCTOBER 1944

Word reaches Halsey of Ozawa's Northern Force and he decides to give chase, just as the Japanese hoped he would. Halsey takes all of his warships with him, leaving nothing behind to guard the San Bernardino Strait and the approaches to the invasion beaches in Leyte Gulf.

07 KURITA RETREATS 25 OCTOBER 1944

Shaken by the frenzied resistance of the American escort carriers and destroyers off Samar and mistakenly thinking he is facing the main US fleet, Kurita breaks contact and his Centre Group retreats back up the San Bernardino Strait.



NORTHERN FORCE
(OZAWA)**06 BATTLE OF
CAPE ENGAÑO**
25 OCTOBER 1944

Halsey's carrier pilots catch Ozawa's Northern Force and sink three of its carriers during the Battle of Cape Engaño. A fourth is sunk by American cruisers. In the meantime, Halsey receives an encoded message about the plight of Seventh Fleet's escort carriers. He sends his battleships south to their aid but they arrive too late to be of any help.

08 VICTORY

The Japanese fleets retire to recover from their hammering. Despite miscommunication that left the invasion fleet exposed, Leyte Gulf is a dramatic victory for the US Navy. It sinks 26 Japanese warships for the loss of seven of its own.

04 BATTLE OFF SAMAR
25 OCTOBER 1944

Kurita's Centre Group, including the super battleship Yamato, is much more powerful than Halsey supposed, and it rushes down the now unguarded San Bernardino Strait. The only ships between them and the amphibious ships are several small escort carriers and their protective destroyers of Taffy 3. In a chaotic action off Samar, the Americans counterattack desperately as immense Japanese naval cannons blast at them. The battleships of Seventh Fleet are in the far-off Surigao Strait and Halsey's Third Fleet is still pursuing Ozawa. Taffy 3 are on their own.

05 BATTLE OF THE SURIGAO STRAIT
25 OCTOBER 1944

In the early morning of 25 October, Nishimura's Southern Force has engaged the battleships, cruisers and destroyers of Kinkaid's Seventh Fleet in the Surigao Strait. In the last battleship action ever fought, the Japanese battleships Fuso and Yamashiro are sunk. Shima's flotilla, coming up behind Nishimura's ships, retreats back the way it had come.

Japanese battleships coupled with the fog of war, convinced Kurita that he was facing the whole of Third Fleet, not a mere invasion fleet covering force. After losing three cruisers, he ordered a retreat. American losses were heavy but, crucially, the vulnerable US invasion fleet had been spared total annihilation.

In the meantime, Third Fleet was still chasing Ozawa's Northern Force and, unfortunately, the rest of the Seventh Fleet was too far away. That same day, in the early morning darkness of 25 October, Nishimura's Southern Force had come up the Surigao Strait, with Shima's group forming a distant rearguard, to be met by the bombardment ships of Seventh Fleet under the command of Rear Admiral Jesse Oldendorf.

Oldendorf's fleet was centred on six old battleships that had been repaired and sent back to war. They'd been providing fire support for the invasion forces but now they duelled with the Japanese. Nishimura's vanguard was built around the battleships Yamashiro and Fuso. A torpedo attack by American destroyers badly damaged Fuso, which later exploded. Yamashiro was struck by torpedoes and then had to contend with the eruption of fire from Oldendorf's battleships and cruisers. Aided by fire control radar, an avalanche of heavy shells plunged into Nishimura's ships. Yamashiro was sunk before dawn, and the heavy cruiser Mogami was lost later that day. Shima,

far to the rear, seeing the catastrophe that had befallen Nishimura's force, turned his own rearguard flotilla around and headed back out of Surigao Strait. The fight was history's last clash between battleships.

Having sought out Ozawa and at last found him, Halsey's Third Fleet carrier planes conducted strikes against the Northern Force on 25 October. Lacking airpower, the Japanese were mauled by the US Navy fliers. In this, the Battle of Cape Engaño, three Japanese carriers were sunk and a fourth was heavily damaged.

In the midst of the battle Halsey received an encoded message from his commander demanding to know where he was. The escort carriers and destroyers of Taffy 3 at this moment were being pulverised and Third Fleet's battleships, which should have been protecting the invasion armada, were nowhere to be found. With a wounded Northern Force ripe for destruction, Halsey was forced to turn his battleships round and head back south to help the embattled Seventh Fleet – but by the time they arrived, the fight was over.

It was an inglorious end for Halsey to the Battle of Leyte Gulf, which was a comprehensive US victory. All told, 216 US Navy ships and two Australian warships crushed a fleet of 64 Japanese vessels. By the end of the skirmish, 26 Japanese ships had been destroyed for the cost of just seven US vessels.

Wildcat fighters prepare to launch from USS Kitkun Bay during the Battle of Samar on 25 October 1944



Alamy



YAMATO

JAPAN'S DOOMED FLAGSHIP

IN 1945 THIS SUPER BATTLESHIP EMBARKED ON A DESPERATE MISSION
TO HALT THE AMERICAN LANDINGS ON OKINAWA, 7 APRIL 1945

WORDS MARC DESANTIS



A grey leviathan looms in the midday light. The battleship's great guns are silent but exude a palpable aura of menace. It drives southwards over the waves of the East China Sea at 20 knots towards its final destination, Okinawa, where an armada of American ships lies offshore overseeing the invasion of the island. Yamato, the pride of the Imperial Japanese Navy (IJN), is a 70,000-ton super battleship, the first of her class and flagship of the Combined Fleet. It is far superior to any other warship afloat.

Yamato is under orders to ravage the American ships off Okinawa with her gigantic 47-centimetre guns, beach herself and fight to the death in the same spirit as the kamikaze pilots who at that moment exact a frightful toll on the US Navy's warships.

Okinawa is an island in the Ryukyu chain, and the last stepping stone for the US forces before

the Japanese Archipelago lying 560 kilometres away. It is here that the battleship is expected to live up to her name, Yamato – a word that embodies the essence of the Japanese nation and people.

However, the flagship will never reach its destination. It is just past noon, 7 April 1945, and Yamato is still 400 kilometres to the northwest of Okinawa. US Navy warplanes have found her. They are circling, visible through gaps in the clouds – midnight-blue angels of death casting judgement over the battleship and her nine escorts.

On Yamato's bridge stands a young assistant radar officer, Ensign Mitsuru Yoshida. He is 22 years old and had been a law student at Tokyo Imperial University just two years before when he was called to serve his emperor. Unlike almost all of his fellows aboard Yamato, he will survive the calamity that is about to befall the

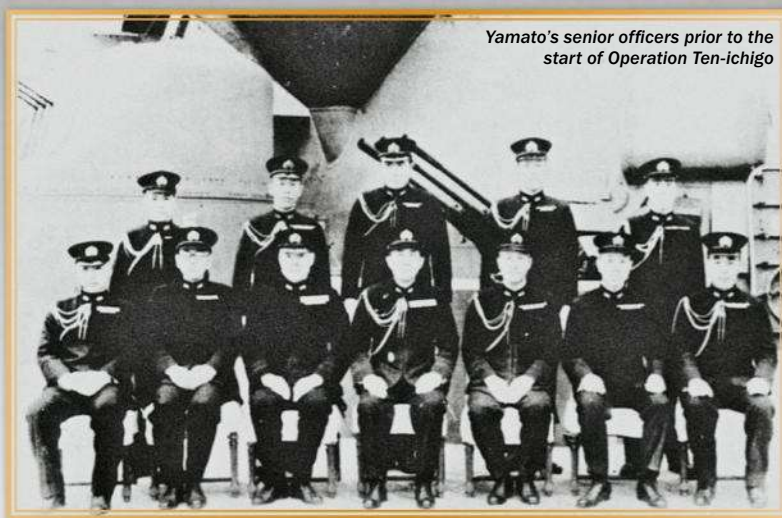
vessel. After the war, he will write a eulogy for the doomed ship and her crew.

Operation Heaven Number One, or Ten-ichigo in Japanese, has little chance of success. The mission has been conceived as a means of restoring a measure of honour to the beleaguered Combined Fleet, which has been shamed by its inaction around Okinawa compared to the kamikaze attacks of Japan's death-seeking pilots. "But where is the navy?" Emperor Hirohito asked Admiral Koshiro Oikawa, his most senior naval adviser, at a 29 March meeting concerning the fighting. "Are there no more ships? No surface forces?"

Oikawa was mortified by the implication that the navy, most of whose ships now lie at the bottom of the Pacific Ocean, was not doing enough. So on 6 April Yamato sailed from Kure Harbour to die at Okinawa, covered in glory for the good of the navy. "The fate of the navy



Curtiss Helldivers go on the attack, 7 April 1945



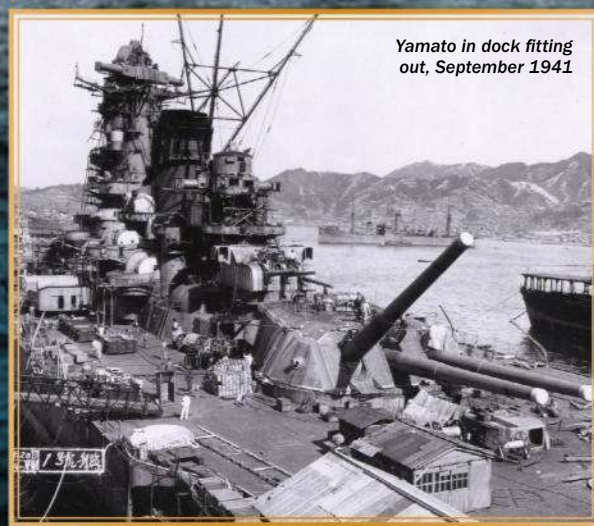
Yamato's senior officers prior to the start of Operation Ten-ichigo



The Japanese super battleship Yamato undergoing sea trials in late 1941



Yamato is attacked by American carrier planes



Yamato in dock fitting out, September 1941

THE MIGHTY BATTLESHIP YAMATO

Yamato was enormous, measuring 263m stem to stern. She displaced 70,000 tons and was 40 per cent bigger than the battleships of the Iowa class, the US Navy's largest. Its superstructure, dominated by the mast and raked funnel, was like a fortress bedecked with guns. Enough steel went into the hull to lay a railway track between Tokyo and Osaka. Yamato bore a full load of munitions for all of its weapons on 7 April 1945.

TYPE 96 25MM ANTI-AIRCRAFT GUNS

Yamato had 152 Type 96 25mm anti-aircraft guns, with 50 in triple mounts and two single mounts.

FUNNEL

AIRCRAFT CATAPULTS

TURRETS

STERN

NAKAJIMA SCOUT AIRCRAFT

The Yamato embarked seven Nakajima floatplanes to conduct reconnaissance. They were launched from catapults at the stern of the ship.

TYPE 89 127MM GUNS

The Yamato carried six Type 89 twin 127mm naval guns, with three on each side of the citadel.

ENGINES

Yamato was powered through the waves by four propellers connected to four steam turbines and driven by 12 boilers, which produced 150,000shp. It gave her a top speed above 27 knots (50kph).

rests on this one action," her crewmen were portentously told as they departed.

Despite her awesome power, Yamato has seen little combat, having engaged the Americans briefly during the Battle of Leyte Gulf in October 1944. The ship has been outmoded since the start of the Pacific War. The strike on Pearl Harbor on 7 December 1941 proved that aircraft carriers, not battleships, were now the arbiters of war at sea. A mere two days later, the Japanese confirmed the vulnerability of surface warships to aircraft when their planes struck and sank the Royal Navy's HMS Prince of Wales and HMS Repulse. Surface ships, however powerful, were extremely vulnerable to air attack unless themselves protected by fighters, and so for much of the war Yamato has been kept sheltered in home waters, awaiting a decisive battle with American battleships that will never come.

The Surface Special Attack Force is under the overall command of Vice-Admiral Seiichi Ito, who uses Yamato as his flagship, while the ship herself is under the direction of Captain Kosaku Ariga. Ito is aghast at what he considers the purposeless waste of his ships and the lives of his men, but he keeps such thoughts from them. Yet the crewmen of Yamato are under no illusion that Ten-ichigo can end in anything besides her destruction. It is a suicide mission. They have been ordered, preposterously, that if they manage to survive long enough to reach the island, they are to arm themselves and

go ashore to continue the fight. Many sailors, aware of what is to come, have written their last letters home to their loved ones.

Awaiting Yamato and the ships of the Second Destroyer Squadron that accompanies it on this death ride is the US Fifth Fleet, riding high at the peak of its wartime might. The Yamato crewmen know they have been spotted by an American submarine, but they are deeply upset that the Americans have radioed their position to the rest of the fleet without even encoding the message, as if they are not taking the great battleship seriously enough.

On Yamato, rice balls and black tea are served to the crew, who sing patriotic songs and shout 'Banzai!', the traditional Japanese battle cry. Ariga, a popular captain, allows some of his younger officers to affectionately pat his bald pate. There is a limit to the levity, however. In contemplation of the swarm of American aircraft that is sure to assail them, one sailor

asks morbidly but with true prescience, "Which country showed the world what airplanes could do by sinking Prince of Wales?"

Ensign Yoshida finds that one of his fellows, Ensign Sakei Katono, is reading Leo Tolstoy's *War and Peace*, while Yoshida buries himself in a biography of Baruch Spinoza. He also sees that another ensign, Kunio Nakatani, is weeping into his pillow. The assistant communications officer aboard Yamato is a Japanese-American from California who was studying in Japan and had the misfortune to find himself stranded there when the war began. He has received, at long last – just before Yamato sailed on her final voyage – a letter from his mother in America, that reaches him via neutral Switzerland. He will never see her again.

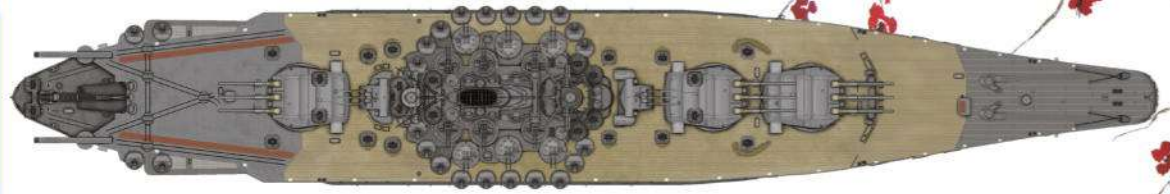
A reconnaissance plane operating off the aircraft carrier USS Essex spies the flotilla at 8.15 a.m. on 7 April. Over the following four hours the Americans doggedly track Yamato and the other ships of the flotilla. Admiral Raymond Spruance, commanding officer of the Fifth Fleet at Okinawa, at first decides to keep his carrier fighters close by to provide cover against the swarming kamikazes and instead sends a powerful squadron of battleships to confront the onrushing Japanese ships. Yamato, it seems, will finally get to fulfil her purpose and duel valiantly with her American peers.

Then Spruance cancels his order. Vice Admiral Marc Mitscher, the commander of the carrier aircraft of Task Force 58, convinces him

"ITO IS AGHAST AT WHAT HE CONSIDERS THE PURPOSELESS WASTE OF HIS SHIPS AND THE LIVES OF HIS MEN, BUT HE KEEPS SUCH THOUGHTS FROM THEM"

RADAR

Three different radar sets were carried by the battleship, including a Type 13 air search radar, Type 21 air and surface search radar and a Type 22 surface search radar.

**TOWER****CITADEL****MAIN GUNS**

The main armament of Yamato consisted of nine Type 94 46cm naval cannons mounted in three turrets. These guns, each weighing 162tn, were the largest ever emplaced on a ship and were capable of hurling a 1,400kg shell to a maximum range of 4km. The ship carried 1,080 of these. Each triple turret weighed a hefty 2,774tn.

ARMOUR

The Yamato possessed substantial protection, carrying 22,500tn of armour – the most ever placed on a warship. Covering the armoured citadel was a 41cm main belt of armour that extended below the waterline. The lower belt that protected the ammunition magazines was 28cm thick. The three main gun turrets had frontal armour of 66cm thickness, while the deck had armour of up to 23cm.

BOW**155MM DUAL-PURPOSE NAVAL GUNS**

The secondary armament of Yamato consisted of six 155mm cannons in two triple-gun turrets. They were capable of taking on targets in the air and on the surface.

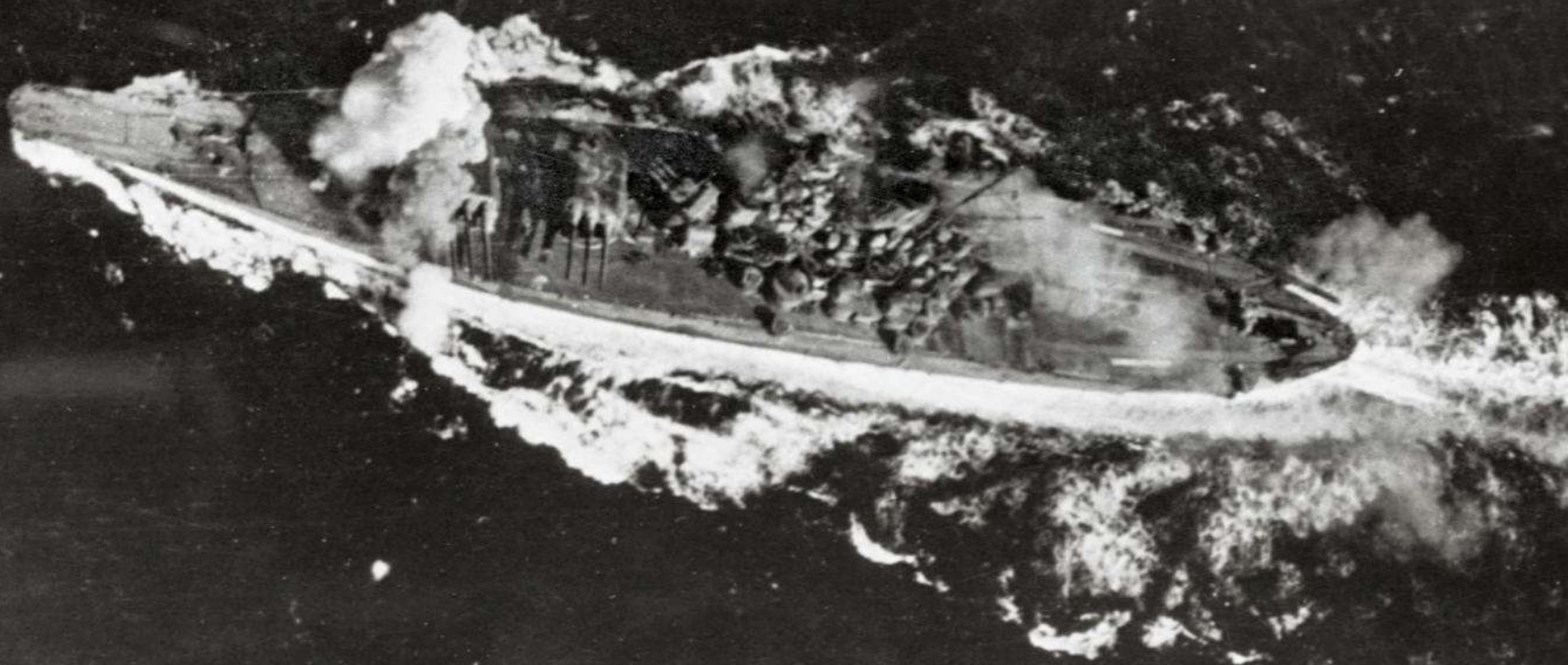
CREW

The Yamato required an enormous crew of some 3,300 men to operate her. Most were berthed below deck ahead of the forward turrets. Crew accommodations were relatively generous, earning her the nickname 'Hotel Yamato'.

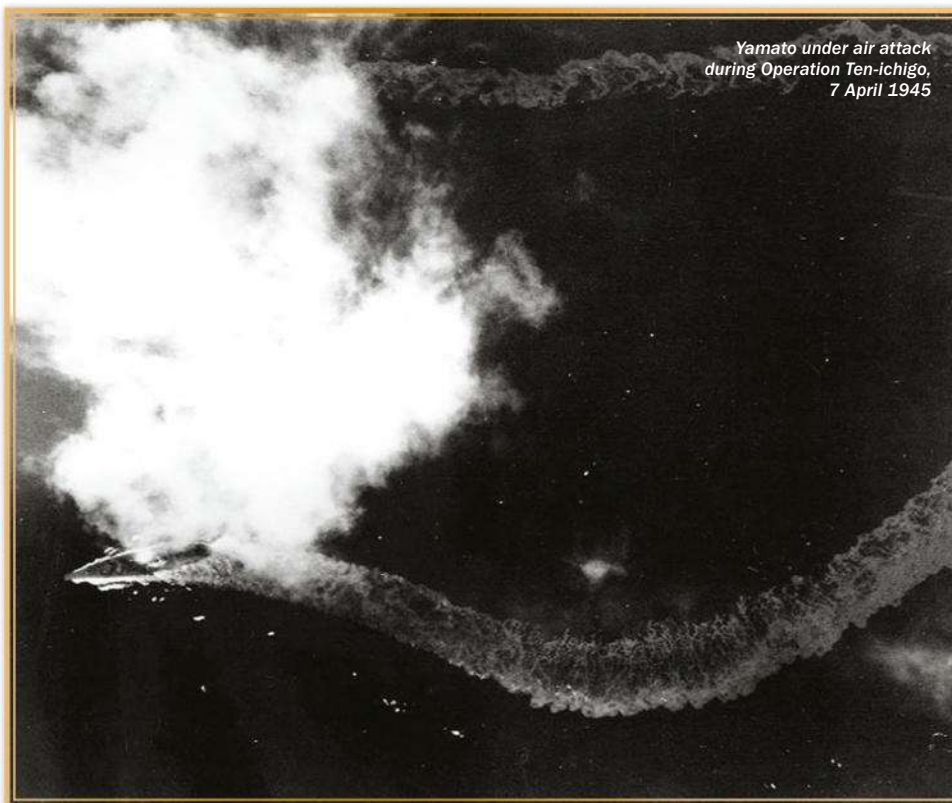
"AT 10.00 A.M. 280 PLANES FROM NO FEWER THAN TEN AIRCRAFT CARRIERS LAUNCH THEMSELVES INTO THE LEADEN PACIFIC SKY, DESTINED FOR A BLOODY RENDEZVOUS WITH YAMATO"

Curtiss Helldivers fly over an American aircraft carrier in 1945. Carriers had surpassed battleships as the dominant force on the oceans by WWII

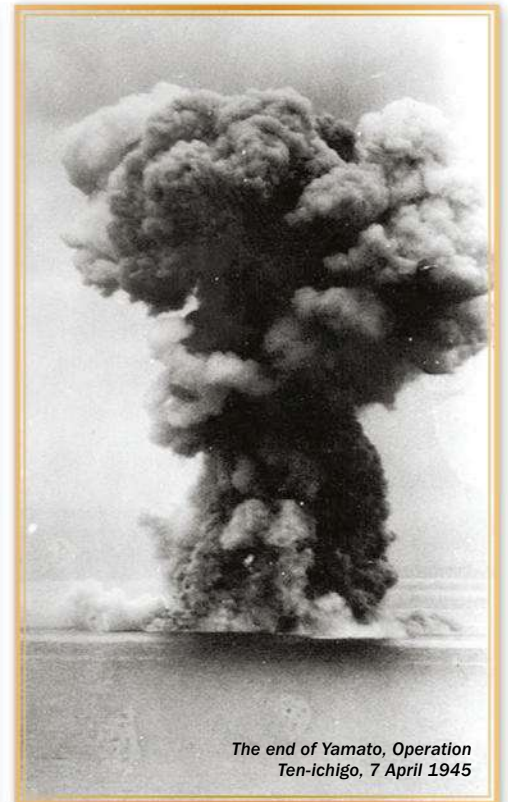
“YAMATO’S EXECUTIVE OFFICER, REAR ADMIRAL NOBII MORISHITA, CAN’T HELP BUT ADMIRE THE PROFESSIONAL COMPETENCE OF THE ATTACKERS. ‘BEAUTIFULLY DONE, ISN’T IT?’ HE SAYS”



The Yamato receiving direct hits from US planes during the attack on 7 April 1945



Yamato under air attack
during Operation Ten-ichigo,
7 April 1945



The end of Yamato, Operation
Ten-ichigo, 7 April 1945

that his planes will be better dealing with the immense Japanese warship. At 10.00 a.m. 280 planes from no fewer than ten aircraft carriers launch themselves into the leaden Pacific sky, destined for a fateful rendezvous with the approaching Yamato.

At 12.00 p.m. Admiral Ito sits on the bridge of Yamato and smiles. He says cheerfully, "We got through the morning all right, didn't we?" The battleship's good fortune will not last long. Just 20 minutes later Yamato's air search radar detects the approaching American aircraft. The Japanese ships are bereft of fighter cover. Their only defences will be the anti-aircraft guns aboard. Then the attacks begin – the first wave of many in a sea of fire and smoke.

Yamato's anti-aircraft batteries and those of her escorts open up in defence. The ferocious fire sent skyward – a prismatic, tracer-lit torrent of searing metal – does the Japanese ships little good. The Americans manoeuvre their machines with great skill. Yoshida grimly observes that their highly trained pilots fly in a straight course only long enough to drop their bombs or torpedoes, then hurriedly zigzag away. The sheer number of aircraft also works in the Americans' favour, as the Japanese gun crews find themselves overwhelmed with a multiplicity of fast-moving targets.

In all, 364 American carrier aircraft pounce on Yamato and the ships in her escort. The light cruiser Yahagi, the lead ship of the Second Destroyer Squadron, goes down after being struck by seven torpedoes and 12 bombs, while US aircraft also hammer the destroyers. It is Yamato, however, that receives the greatest attention from the American fliers. They concentrate their torpedo strikes on the port side of the ship to cause her to list quickly.

Wave after wave of Avenger torpedo bombers and Helldiver dive bombers, protected by

“THE FEROCIOUS FIRE SENT SKYWARD – A PRISMATIC, TRACER-LIT TORRENT OF SEARING METAL – DOES THE JAPANESE SHIPS LITTLE GOOD”

Corsair and Hellcat fighters, surge over Yamato. Yamato's executive officer, Rear Admiral Nobii Morishita, can't help but admire the professional competence of the attackers. "Beautifully done, isn't it?" he says. She is hit by one torpedo after another. Between 11 and 13 strike her, together with no fewer than eight bombs. There are many more near misses, and she lists worryingly to port. She takes on thousands of gallons of seawater to counter the listing but to little avail. The waves crash over her port side. At 2.10 p.m. a bomb strikes her rudder, damaging it and knocking out all power in the ship. She can no longer manoeuvre. Yoshida spies a thin, human-sized length of flesh dangling from a rangefinder. Her crew has been equally savaged.

Another wave of enemy planes bears down on Yamato. "Don't lose heart," Captain Ariga keeps urging the surviving men on the bridge. But there is no hope for Ten-ichigo. Admiral Ito's flotilla has been shredded by American airpower to no purpose, just as he had expected. Like Yahagi, most of the destroyers have been smashed. He calls off the operation and commands his remaining ships to return home after picking up survivors from disabled ships. After giving this order, he goes to his cabin and closes the door behind him. He will never emerge. Captain Ariga calls his crew to

Yamato's deck as water floods the stricken vessel and orders them to abandon ship. He will not be leaving with them. Ariga binds himself to a binnacle so that he will go down with his ship. "Long live the emperor!" he cries.

Yamato's severe list is now reaching an astonishing 90 degrees to port. As she continues to roll, the giant shells she stows for her main guns slip and slide in their magazines, their fuses striking bulkheads and overheads. They begin to detonate. By 2.23 p.m. Yamato is completely upside down and begins to sink. The greatest of these blasts consumes her, sending up a mushroom cloud of fiery smoke that can be seen all the way back in Japan.

Ensign Yoshida is indescribably lucky. The plunging Yamato was about to pull him under when this final explosion propels him back to the surface. He will live. The remains of the battered Yamato finally sink in 883 metres of water. Yoshida, who will become a bank executive after the war, is plucked from the oil-choked water by the destroyer Fuyutsuki. He writes his *Requiem for Battleship Yamato* years later, calling Ten-ichigo "An operation that will live in naval annals for its recklessness and stupidity."

The Japanese navy loses seven ships in Ten-ichigo, including Yamato, along with 4,250 sailors. Only three destroyers escape the carnage. The US Navy's losses are much lighter – a mere ten warplanes and 12 airmen. When Emperor Hirohito learns of the failure of the operation and the loss of Yamato, he raises his hand to his head and sways. "Gone?" he says in shocked disbelief. "She's gone?"

The Okinawa invasion will not be stopped. It continues until late June, when the last Japanese resistance is crushed. Of the 3,300 crewmen of Yamato, just 269 survive. Her dead are among the first casualties in the Okinawa campaign. They are not the last.

TITANS OF TOMORROW

SCIENCE FICTION IS BECOMING SCIENCE FACT AS FLEETS ACROSS THE GLOBE DEPLOY LASERS, RAILGUNS AND INVISIBILITY IN THEIR BID TO RULE THE WAVES

110 Modern warships

In order to face the challenges of the future ships around the world are constantly adopting cutting-edge weaponry and equipment

116 Super submarines

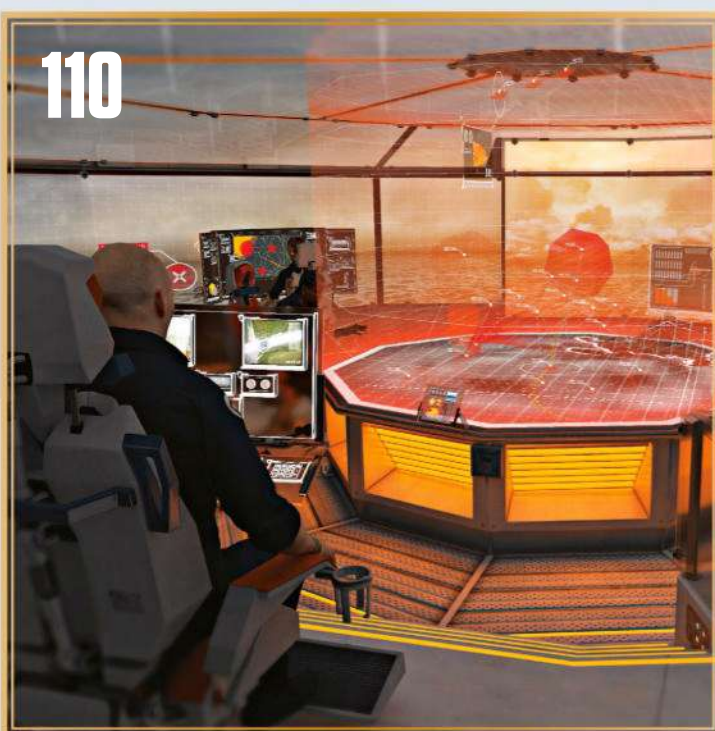
The vessels kitted out for war beneath the surface have come a long way since their earliest incarnations

122 Next-gen battleships

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Is the next great naval clash about to erupt in the world's most hotly contested stretch of water?



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TITANS OF TOMORROW



MODERN WARSHIPS

HOW THE NAVY OF THE FUTURE WILL RULE THE WAVES

WORDS NICK SOLDINGER

Illustrations by Tobias Roetsch

*NOT TO SCALE

MEET THE FLEET

THE TYPES OF NAVAL WARSHIPS BEING CALLED INTO BATTLE TODAY*

Despite what the popular board game suggests, naval warfare isn't as easy as shouting a series of coordinates until the enemy's vessel is obliterated. A real-life game of battleships is all about military planning, precision and firepower.

Early battleships launched during the late 19th and early 20th century carried enormous guns capable of launching projectiles across the ocean surface at targets thousands of metres away. To defend themselves against enemy ships with equal firepower, they needed to be heavily armoured too, with thick steel plates encasing their huge hulls.

During World War I, battleships became dominant naval weapons. Prior to the Great War, Germany challenged the Royal Navy as the most powerful fighting fleet. Britain hit back with the revolutionary HMS Dreadnought, kick-starting a naval arms race. However, by the outbreak of World War II, superior aircraft and submarine weapons had rendered the battleship obsolete, enabling the aircraft carrier to seize its position as capital ship of the fleet.

Navies could now attack targets within a much greater range than existing naval guns could reach simply by sending out aircraft to deliver the devastating firepower instead. As a result, the role of warships became more about close-range combat, with destroyers and cruisers carrying fewer and smaller guns, enabling them to be much lighter and more easily manoeuvrable when seeking out enemy targets to destroy.

Today, navies have an assortment of warships that they can call upon to tackle any situation, whether it's providing security for other vessels, responding to humanitarian disasters or attacking an enemy submarine hidden beneath the water. As new ships are developed, speed, efficiency and cost-effectiveness are key, with increased automation helping to shrink crew sizes and reduce costs.

For fleets of the future, only a few crew members may be needed onboard, as computers, drones and unmanned boats carry out the difficult and dangerous duties instead. Advancements in technology could also bring back battleship-level firepower, with electromagnetic railguns and even laser weapons replacing heavier, more expensive firearms in the navy arsenal.

If these visions for future navy vessels come true, it could be even harder to catch up with, let alone sink, your opponent's ship in D7, before they fire their laser at your aircraft carrier in B10.

"FOR FLEETS OF THE FUTURE, ONLY A FEW CREW MEMBERS MAY BE NEEDED ONBOARD, AS COMPUTERS, DRONES AND UNMANNED BOATS CARRY OUT THE DIFFICULT AND DANGEROUS DUTIES INSTEAD"

AIRCRAFT CARRIER

These enormous airbases at sea are equipped with a flight deck for launching and landing short-range aircraft wherever they are needed.



CRUISER

The second-largest warships after aircraft carriers, cruisers have guided missile systems for taking out targets above, below or on the waves.



DESTROYER

These are slightly smaller and therefore more agile than cruisers and can provide protection from a variety of adversaries.



FRIGATE

Designed mainly to hunt submarines, frigates are generally smaller than destroyers and are used to protect other warships and merchant convoys.



CORVETTE

The navies of countries bordering small seas instead of large oceans often use small, lightly armed corvettes to patrol their coasts.



SUBMARINE

These stealthy underwater vessels are silent hunters capable of surveillance and reconnaissance missions as well as launching missiles.



AMPHIBIOUS ASSAULT SHIP

With a primary objective to get troops and their equipment to shore, these vessels can launch helicopters and other amphibious landing craft.



THE FUTURE OF WARSHIPS

WHAT WILL NAVAL FLEETS LOOK LIKE IN THE YEAR 2050?

The Royal Navy has asked this very question, challenging young British scientists and engineers to design the fleet of the future. Their vision is the Dreadnought 2050 concept, a high-tech trimaran vessel built for speed, stability and efficiency. Named after the 1906 HMS Dreadnought, which was also a revolutionary vessel in its day, the sleek ship is almost fully automated, cutting today's crews of 200 down to 50 or 100 members.

Renewable energy technology could also give the ship unlimited range, allowing it to sail the world without stopping to refuel, and advanced

weapons will provide immense firepower in battle. While some of the technologies envisioned for the Dreadnought 2050 are not yet achievable, others could realistically be incorporated into future designs, lowering the cost and manpower needed for the next generation of warships.

THE DREADNOUGHT 2050 CONCEPT

THE ROYAL NAVY'S PLANS FOR A HIGH-TECH WARSHIP OF THE FUTURE

DISARMING TECHNIQUE

The tether is made from cryogenically cooled carbon nanotubes that can transmit power to the quadcopter's laser weapon and knock out enemy aircraft.

SEE-THROUGH SHELL

The hull is made from ultra-strong acrylic composites that can be turned translucent by running an electric current through them.

FLIGHT DECK

The extendable flight deck at the back of the ship can be used to launch unmanned aerial vehicles (UAVs) equipped with weapons.

3D PRINTING

If additional UAVs are needed, they can be constructed onboard the ship using 3D printing technology.

The flight deck's hangar can hold weaponised drones and a helicopter

FLOODABLE GARAGE

Beneath the extendable flight deck and its fleet of drones is a garage full of even more specialist craft. These include unmanned underwater vehicles (UUVs) that can be used to detect mines on the ocean floor and amphibious vessels used to transport troops to and from the shore for raiding missions. When the door of the garage is opened at sea, water floods in to submerge the lower level, transforming it into a platform from which these craft can be launched and recovered. A 'moon pool' – or small hole in the floor of the garage – also enables submersibles to be deployed while the garage door is closed.

HYPERSONIC MISSILES

Tubes running along the sides of the ship carry hypersonic missiles that can travel at over five times the speed of sound.

HOLOGRAPHIC COMMAND CENTRE

The days of pushing model ships around a map are long gone, as future naval operations will be planned using a 3D holographic command table. Located in the operations room at the heart of the ship, the table will allow commanders to rotate and zoom in to the hologram for a closer look at specific areas of the battlefield thousands of miles away. Banks of 2D multi-functional displays can also be used to present and transmit data in real-time, while 'Google Glass-like' walls overlay additional information on a 360-degree view of the ship's surroundings.

TETHERED DRONE

Instead of a conventional mast, a quadcopter carrying sensors such as radar is tethered above the ship.

"A HIGH-TECH TRIMARAN VESSEL BUILT FOR SPEED, STABILITY AND EFFICIENCY"

The ship's railgun uses electromagnetism to propel its projectiles

TORPEDO BUBBLES

Tubes in the outrigger hulls contain torpedoes that can travel at 556kph, as they are encased in a bubble of gas that reduces friction.

TOUGH EXTERIOR

The hull is coated in graphene, a strong yet lightweight material that will reduce drag for faster sailing.

ELECTROMAGNETIC RAILGUN

Located on the ship's bow is a high-powered railgun that uses electromagnetic effects instead of explosive chemical propellants. The US Navy's current prototype railgun can fire projectiles at speeds of over Mach 7 (8,644kph) using kinetic energy rather than conventional explosives to inflict damage and destroy the target.

ARMATURE

OPPOSING MAGNETIC FIELDS

The current creates a magnetic field around each rail, one running clockwise and the other counter-clockwise.

POSITIVE RAIL

PROJECTILE

NEGATIVE RAIL

THIRD MAGNETIC FIELD

A third magnetic field running perpendicular to the rails is created around the armature.

ELECTRIC CURRENT

An electric current is passed up the positive rail, across the armature, and back down the negative rail.

AIM AND FIRE

The force propels the armature forward, firing the projectile towards its target.

LORENTZ FORCE

The electric current and magnetic field interact to create what is known as Lorentz force, which accelerates the projectile.

NEXT-GEN AIRCRAFT CARRIERS

MEET THE COLOSSAL CENTREPIECE OF THE US NAVY FLEET

Aircraft carriers are often the capital ships of a nation's navy, helping to project airpower worldwide. The US Navy currently has ten enormous nuclear-powered supercarriers in its fleet, but a long-overdue upgrade joined the ranks in 2016. The first of the new Ford-class carriers, the USS Gerald R Ford, also known as CVN 78, is similar in size to its predecessor Nimitz-class ships, but as the first aircraft carrier to be completely designed using 3D computer modelling, it's lighter, cheaper and more powerful.

Increased automation means that between 500 to 900 fewer crew members are needed onboard, and for the first time, air conditioning is available throughout the ship, making life at sea more comfortable.

The carrier can hold up to 90 aircraft at a time, but instead of launching them using the steam-powered catapults found on modern-day ships, an electromagnetic launch system is deployed to fire them into the air. This works in a similar fashion to a railgun but uses an aircraft as the projectile.



The USS General R Ford's command centre, known as the 'island', sits on the flight deck

"IT'S THE FIRST AIRCRAFT CARRIER TO BE COMPLETELY DESIGNED USING 3D COMPUTER MODELLING"



The final weight of the ship is over
90,000 TONS
The equivalent of
400
STATUES OF LIBERTY

AROUND
200,000 GALLONS
of paint were needed to cover the ship, enough to cover
350
TIMES
THE WHITE HOUSE

10 MILLION
feet of electrical cable was installed onboard, enough to reach the INTERNATIONAL SPACE STATION almost
8
times over

220
AIRCRAFT
can be deployed from the flight deck each day,
25%
more than from the Nimitz-class ships

Reduced manning and maintenance will save the US Navy more than
\$4 Billion
(APPROX. £2.6 BILLION)
over the ship's
50
LIFESPAN

The heaviest component of the ship weighs
1,026
AS MUCH AS
6 BOEING 747 JETS
It was hoisted into place by a
1,050
TONS
crane called Big Blue

SILENT SUBMARINES

THE STEALTHY 'BLACK HOLE' SUBS THAT ARE UNDETECTABLE IN BATTLE

They may be hard to miss when on dry land, but Improved Kilo-class submarines are able to travel unseen through the depths. These diesel-electric subs are considered to be the quietest in the world, leading NATO to nickname them 'black holes' due to their low noise and visibility. Despite weighing around 4,000 tons, the subs can reach speeds of 37 kilometres per hour, and can patrol for up to 45 days at a time.

Once they have snuck up on the enemy, eight infrared-guided surface-to-air missiles

can then be fired at targets above the water, or computer-controlled torpedoes can be deployed beneath the waves. The submarine's array of sensors mean that it can detect enemy vessels at a range three- to four-times greater than it can be detected itself. This surveillance data can then be used by the onboard computer to calculate firing parameters and recommend manoeuvres and weapon deployment. The six stealthy subs in this class have been patrolling the Black Sea since the end of 2016.

The Stary Oskol is the third of six Improved Kilo-class subs now in service in the Russian Navy



DRONE BOATS

THE UNMANNED VESSELS SAVING SAILORS FROM HIGH-RISK MISSIONS

With aerial drones already being used in military combat, it was only a matter of time before unmanned boats came onto the scene.

The Royal Navy currently has a fleet of modified rigid inflatable boats (RIBs) in development that will be able to perform complex surveillance and reconnaissance missions, without putting sailors in harm's way. Using an arsenal of sensors including a navigation radar, a 360-degree infrared camera array and a laser rangefinder, the vessels are able to operate autonomously while avoiding collisions and will provide

added protection for the Queen Elizabeth-class aircraft carriers once they enter service.

The US Navy is also developing similar unmanned vessels that will be able to swarm and attack enemy targets, and the US defence agency DARPA even has plans for an 'Anti-Submarine Warfare Continuous Trail Unmanned Vehicle' that will be able to use artificial intelligence and sensors to hunt for enemy submarines.



LONG RANGE

The RIB drone can operate for 12 hours at a time up to 40km away from its parent ship.

COMPLEX MISSIONS

It can be used to patrol areas of interest, provide surveillance and reconnaissance and protect larger ships in the fleet.

TOP SPEED

It can reach speeds of up to 71kph per hour on the water.

FLEXIBLE CONTROL

It can operate autonomously on a pre-planned route or be remotely controlled by crew on land or the parent ship.

MODIFIED VESSEL

The drone is a modified version of the manned Pacific 24 RIB in service on Type 23 frigates and Type 45 destroyers.



CONSOLIDATED PBV CATALINA

The US Navy has turned science fiction into reality by developing a real-life laser gun that can blow up targets in an instant. Although they won't be using it to fight space aliens any time soon, the Laser Weapon System (LaWS) has been successfully tested at sea, proving that it is capable of blowing up moving targets on aerial drones and small boats. The weapon, which has been installed onboard the USS Ponce, consists of six commercial welding lasers joined together and can deliver 30 million times as much power as a hand-held laser pointer. It is operated using an Xbox-style controller and can be used to simply disable a target's sensors and instruments or destroy it completely.

As well as improved accuracy, another big advantage of LaWS is its cost, as the price of firing the laser is just 59 cents (39 pence) per shot, compared to the whopping \$2 million (£1.3 million) needed for a traditional missile.



LaWS is operational onboard USS Ponce and can be used to defend against unmanned targets

"THE US NAVY CURRENTLY HAS 68
SUBMARINES IN ACTIVE SERVICE"

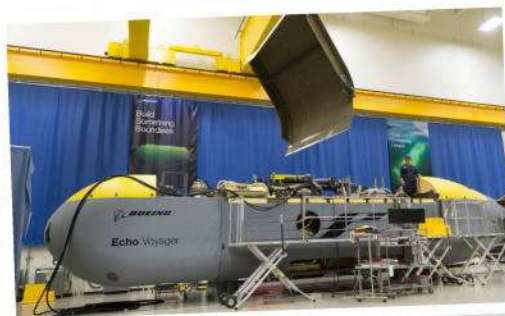


SUPER SUBMARINES

THE INCREDIBLE TECH POWERING THE WAR BENEATH THE WAVES

SUBMARINES: IN DEPTH

MAJOR MILESTONES IN THE DEVELOPMENT OF UNDERWATER VESSELS



The unmanned Boeing Echo Voyager

Lurking in the depths, hundreds of submarines are currently patrolling the world's oceans, performing a range of very important – and often covert – missions. These stealthy vessels were first widely used during World War I, with Germany's U-boats responsible for destroying several British supply ships during the conflict, and have since changed the face of naval warfare forever.

Always referred to as boats rather than ships as a matter of naval tradition, submarines have come a long way since the human-powered vessels of the past. Most modern submarines use either diesel-electric propulsion or nuclear reactors to keep them running. The former are equipped with diesel engines to drive the submarine's propellers and charge its batteries while on the surface. Then, when submerged, those batteries power electric motors that spin the propellers to move it through the water.

The need to recharge the batteries and replenish fuel for the engines gives these submarines a limited range, so many navies prefer nuclear-powered vessels instead. These boats can stay underwater for weeks at a time, using nuclear fission to release energy in the form of heat, which in turn generates steam to drive a turbine and spin the propellers.

Now crucial tools for navies large and small, submarines transport crews all over the world, sneaking up on enemy ships, launching missiles, and gathering information while remaining hidden in dark, murky waters. They can generally be divided into two categories: attack submarines, which are designed to seek and destroy enemy ships, and ballistic missile submarines, which attack land-based targets. The US Navy currently has 68 submarines in active service, 54 of which are attack vessels.

It's not just the military that uses these clever underwater crafts, though. With scientists knowing more about outer space than they do about the world's oceans, submarines are incredibly useful for studying marine environments, at depths too great for human divers to reach alone.

In recent years, new unmanned underwater vehicles (UUVs) have begun appearing in the water, capable of conducting dangerous missions while human crews remain safely on the shore or a nearby ship. These vehicles are small with a limited range, but in the future they could replace the submarines we know today.



HMS Astute firing a cruise missile

DREBBEL I

The first submarine was invented by Dutch engineer Cornelius Drebbel. It was an enclosed wooden rowing boat covered with watertight greased leather and had air tubes protruding to the surface to supply oxygen.

TURTLE

The first recorded submarine attack was during the American War of Independence. A Turtle was used in an attempt to blow up the HMS Eagle, but the pilot was unable to attach the bomb to the ship's hull.

NAUTILUS

American inventor Robert Fulton's submarine was driven by a hand-cranked propeller, but a collapsible mast and sail provided the propulsion. It was commissioned by Napoleon to use against the British.

PLONGEUR

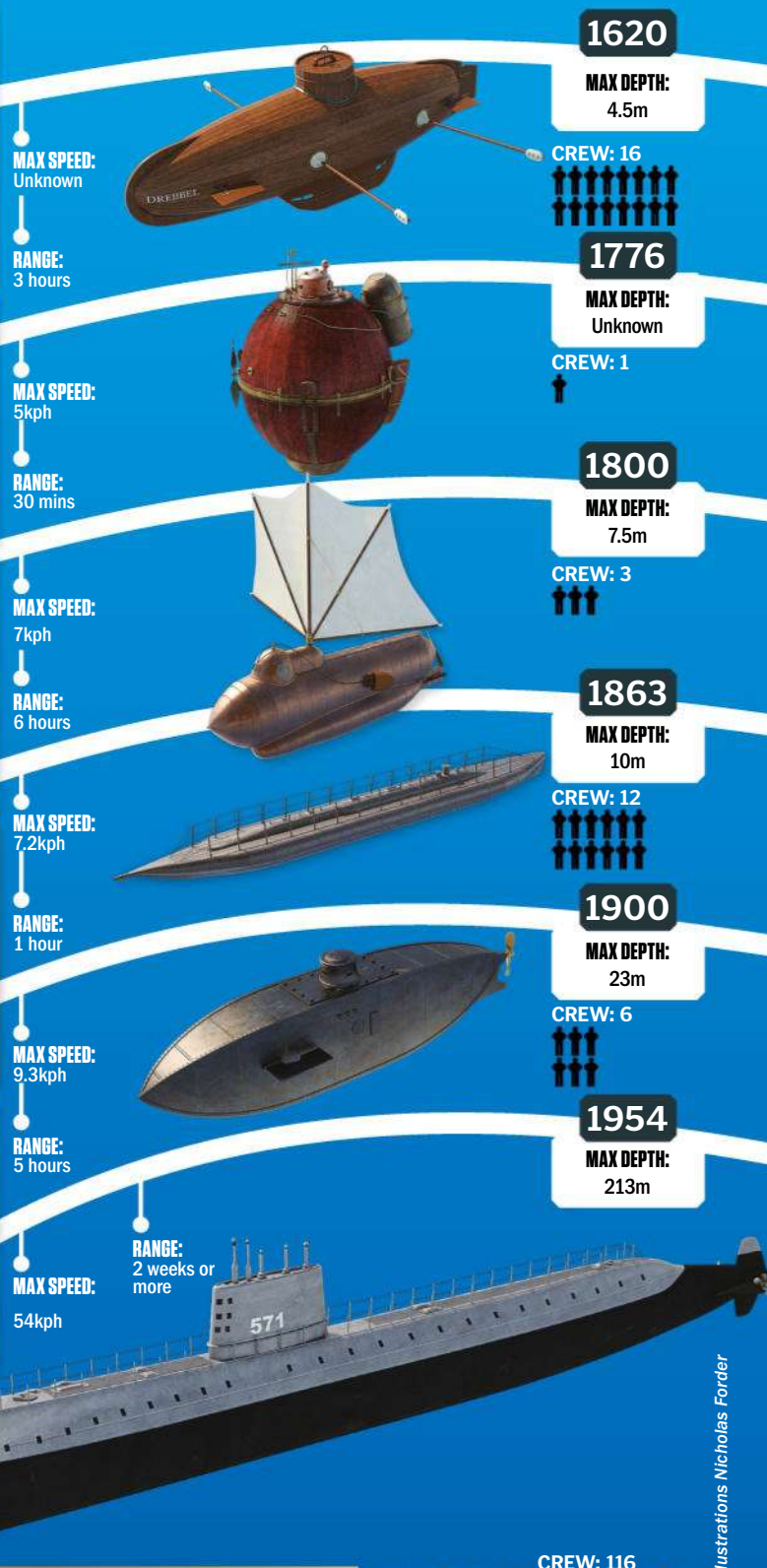
Powered by engines running on compressed air, the Plongeur was the first submarine to not rely on human propulsion. It had a ram and torpedo, but engine problems meant it never passed the trial stage.

USS HOLLAND

Irish engineer John Philip Holland was the first to use electric motors and an internal combustion engine to power an underwater vessel. His creation was purchased by the US Navy and influenced many designs.

USS NAUTILUS

The first nuclear-powered submarine combined stealth and speed in order to revolutionise naval warfare. Constructed under the direction of US Navy Captain Hyman G Rickover, the 97m long USS Nautilus accomplished the first voyage under the geographic North Pole and had a career spanning 25 years.



LIFE ONBOARD A SUBMARINE

HOW CREWS SURVIVE HUNDREDS OF METRES BENEATH THE SEA

The job of a submariner is physically, mentally and emotionally demanding, as they can spend months at a time living in cramped conditions, with only the other members of their 100-plus crew for company. In the past, they had no means of communication with the outside world for the entire length of their mission, but today email can be used to keep in touch with loved ones at home.

Of course, the human body isn't built for life below the waves, so keeping a crew alive requires some clever technology and engineering. To protect them from the crushing

water pressure, the submarine features a strong inner hull in addition to the outer hull that gives the vessel its streamlined shape.

Oxygen is supplied via pressurised tanks or can be created onboard by splitting seawater into hydrogen and oxygen using an electric current. The carbon dioxide the crew breathes out is then removed using scrubbers – devices that trap the CO₂ in soda lime using a chemical reaction. Fresh water is also created onboard, as seawater can be heated to remove the salt, and then the water vapour can be cooled and condensed into a drinkable liquid.

DEEP-SEA RESCUE MISSION

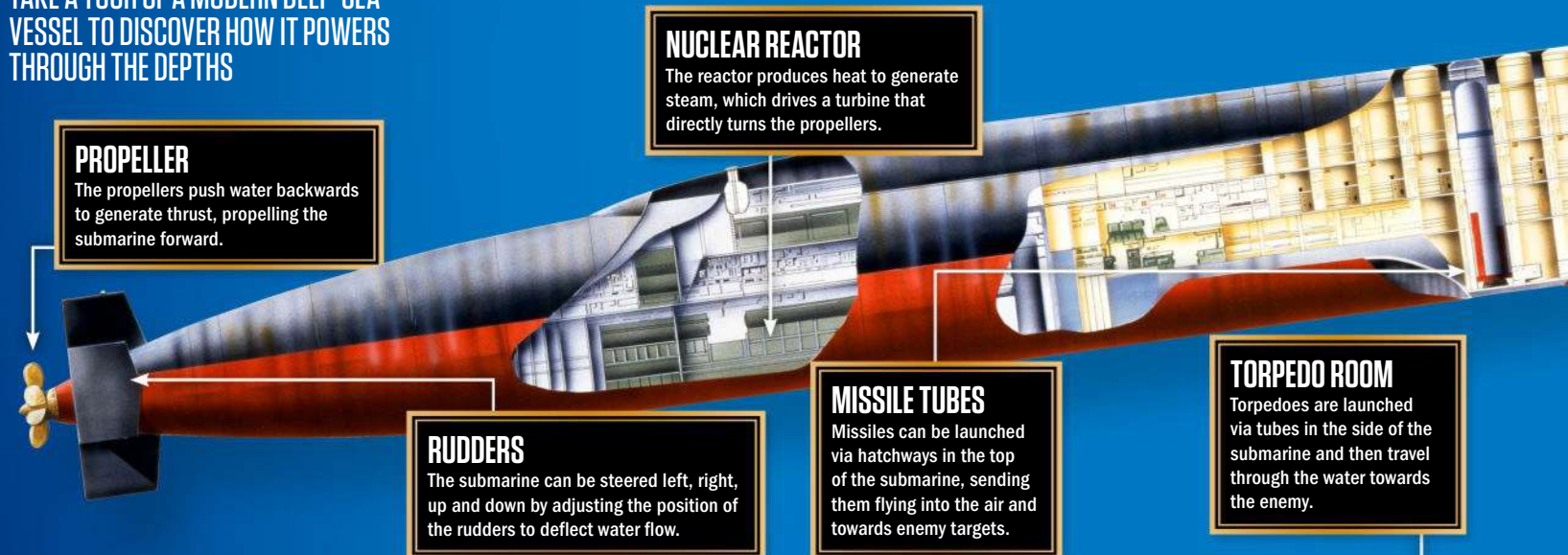
If a submarine is damaged, perhaps due to a collision or an onboard explosion, then the crew will radio a distress call and launch a buoy that will signal their location. Rescue will come in the form of a Deep-Submergence Rescue Vehicle (DSRV), a mini submarine that can be transported by truck, aircraft, ship or another submarine. Once it is near to the damaged vessel, the DSRV can dive down, search for it using sonar, and then latch onto its hatch. When an airtight seal has formed, the hatch is opened and the crew can load onto the DSRV in groups of 24.



The US Navy's Deep-Submergence Rescue Vehicle, Mystic, attached to the USS La Jolla attack submarine

FLOODABLE GARAGE

TAKE A TOUR OF A MODERN DEEP-SEA VESSEL TO DISCOVER HOW IT POWERS THROUGH THE DEPTHS

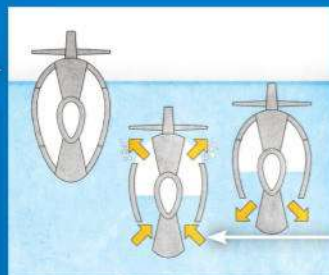


HOW DO SUBMARINES DIVE?

Normally, a boat floats because the volume of water it displaces weighs the same as the boat itself. In order to sink, a submarine must weigh more than the water it displaces, creating a negative buoyancy. This is achieved by flooding ballast tanks, located between the sub's inner and outer hulls. To maintain a set depth, there needs to be a precise balance of air and water in the ballast tanks so that the sub's density is equal to that of the surrounding water.

SURFACING

The water inside the ballast tanks is pumped out and replaced with air stored in tanks, making the submarine lighter and able to surface.



DIVING

Hatches are opened to fill the ballast tanks with water, making the submarine heavier than the water it has displaced, thereby causing it to sink.



HMS Ambush returning to its home port, HMNB Clyde

“KEEPING A CREW ALIVE REQUIRES SOME CLEVER TECHNOLOGY AND ENGINEERING”

UNDERWATER NAVIGATION

Little light is able to penetrate 200 metres below the ocean surface, so submarine crews use other methods to find their way. Inertial guidance systems can help to keep track of the sub's journey from a fixed starting point using gyroscopes and accelerometers to measure changes in motion, but they must be regularly realigned to ensure the vessel remains on course. On the surface, this can be done using GPS, radio and radar satellite navigation systems, but underwater sound navigation and ranging (sonar) are used. This helps to identify ocean-floor features, allowing the crew to plot the sub's location.

ANTENNA

Underwater communications are carried out using low-frequency radio waves, which are able to penetrate the water.

SNORKEL

When surfaced, air enters the sub through a snorkel, but when submerged, oxygen is generated onboard the boat.

PERISCOPE

Objects above the surface can be observed via a series of mirrors that reflect light down to the viewer's eye.

SOUND WAVES

The sonar sphere emits pulses of sound waves that travel through the water.

CALCULATING DISTANCE

By measuring the time that it takes for the sound wave to get back to the sphere, the distance between the sub and the object can be calculated.

BOUNCE BACK

When the sound waves hit an object, they reflect back towards the sonar sphere.

BALLAST TANKS

This compartment is used as a ballast to provide stability for the submarine and works by controlling the boat's buoyancy.

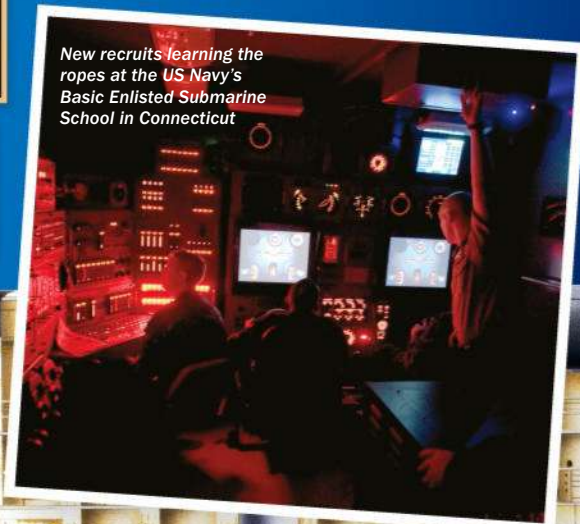
CONTROL ROOM

Navigation, communications and weapons systems are operated from the submarine's nerve centre.

CREW CABINS

Crews of around 100 submariners live on the boat for months at a time without resurfacing, sleeping in cramped bunks between shifts.

New recruits learning the ropes at the US Navy's Basic Enlisted Submarine School in Connecticut



THE FUTURE OF SUBMARINES

WHAT WILL UNDERWATER CRAFTS LOOK LIKE IN YEARS TO COME?

With technology advancing at speed, it will not be long before we find out whether the future of submarines is supersonic, unmanned or something else entirely. In fact, the latter is being explored by defence and security company Saab, and it is currently constructing two new super-stealthy Type A26 submarines for the Swedish Navy. With intelligence gathering and surveillance along coastlines becoming increasingly important, these high-tech submarines will be able to operate in shallow waters and also feature Genuine HOlistic STealth (GHOST) technology, making

them virtually silent and almost impossible to detect.

Per Neilson, program manager for the A26, says, "It will be much quieter, the sensors will be more advanced – detecting and documenting everything that goes on in the sea – and there will be a number of new capabilities such as the multi-mission portal in the bow that allows for the hosting of divers and small manned or unmanned vehicles. It will be a first-class intelligence-gathering platform." The A26 sub will dive to depths of 200 metres and carry a crew of 26. It is due to be completed in 2022.

The A26 submarine will be 62m long and weigh around 1,800tn

GHOST SUB

THE SWEDISH NAVY'S NEW HIGH-TECH SUBMARINE THAT WILL BE INVISIBLE IN THE WATER

CLEVER COATING

The hull is coated in a material that absorbs noise and makes the submarine difficult to detect using infrared cameras.

ENDURANCE

Next-generation, air-independent engines burn liquid oxygen and diesel fuel and allow the submarine to stay fully submerged for several weeks undetected.

SILENT OPERATION

Rubber mountings minimise noise from the engines and other operating machines as well as help to absorb shocks from impacts.

HOW YOU CAN EXPLORE THE OCEAN

High-tech submarines aren't just reserved for the world's navies and scientists; DeepFlight has created a personal underwater craft that just about anyone can use to explore the oceans. The Super Falcon Mark II is an electric craft that can be operated with minimal training and dives to a maximum depth of 120 metres. It can carry two people, a pilot and a passenger, and is small enough to fit on a standard yacht, so you can take it for a dive wherever you are in the world. The submarine is safe to use around marine wildlife, and if you do encounter any trouble, whether it's shark-related or not, it will automatically return to the surface.



RECONNAISSANCE

Sophisticated sensors allow for improved intelligence gathering, which is collected and analysed using the onboard combat-management system.

MAGNETIC DETECTION

Sensors control the electric current flowing through the hull, cancelling out any distortions to the Earth's magnetic field that can reveal the boat's location.

MODULAR DESIGN

A sectional hull means that the submarine can be easily customised and upgraded, making it more cost-effective in the long term.

MULTI-MISSION

The sub can be easily customised for different missions. For example, the bow can be used to launch and retrieve either divers or UUVs.

SHOCK RESISTANT

The submarine is constructed from special steels to ensure that it can withstand significant shocks from any underwater explosions.

UNIQUE SHAPE

The hull design helps to reduce noise caused by the movement of water around the submarine.

The A26 will be able to withstand temperatures down to -2°C

The A26 has a maximum speed of 22kph and can stay at sea for 45 days at a time

Divers can be deployed from the sub's bow for stealth missions

NEXT-GEN BATTLESHIPS

THE FIREPOWER ON THE LATEST BATTLESHIPS IS MIND-BOGGLING – WE EXPLORE THE TECHNOLOGY TRANSFORMING 21ST-CENTURY NAVAL WARFARE



If you thought that the golden age of naval combat came to an end 200 years ago, then clearly somebody forgot to tell the national navies of today, as a wave of state-of-the-art, armed-to-the-teeth battleships are currently emerging from shipbuilding yards with a singular aim in mind: total domination of the world's seas.

From the brand-new and brutal Type 45 destroyers being pushed out of British dockyards, through to the almost sci-fi Zumwalt-class battleships emerging in the US, and on to the cruising carrier vessels sitting like small islands in Earth's oceans, battleships are being produced en masse and to a more advanced spec than ever before.

Far from the basic heavyweights of bygone centuries, required simply to go toe-to-toe with

each other in a deadly game of broadsides, today's warships need to take down a variety of threats, whether at sea, on land or in the air, and they need to do so at extreme range. As such, step onto a battleship today – be it a frigate, destroyer or corvette – and you'll find an arsenal of incredible weapons systems.

There are cannons that can fire over distances of 95 kilometres and deliver a guided smart munition to a target with pinpoint accuracy, as well as Gatling guns that can automatically track a target moving at hundreds of miles per hour and then fire explosive bullets at up to 1,100 metres per second to take it down.

Modern missile launch systems are capable of launching a wide variety of city block-levelling missiles directly into the heart of enemy

encampments in minutes from a safe distance, while naval guns are now built to subject a target to continuous bombardment with high-explosive shells with controlled abandon. All this is but a taste of the weaponry being fitted to the most advanced 21st-century warships.

The heavy armament of vessels currently knows no bounds, with even coastguard fleets, convoy vehicles and civilian support ships being outfitted with some form of military-grade offensive weaponry.

Clearly, controlling the world's waters is not as old-fashioned a priority as the history books would have us believe. In this feature we take a look at the various types of battleship taking to the seas and the weapon systems that are revolutionising not just naval combat but warfare in general.

RULES OF ENGAGEMENT

THE KEY STAGES AND TECHNOLOGY THAT DECIDE THE OUTCOME OF A MODERN NAVAL BATTLE

THREATS

Modern battleships are designed to engage a number of threats, including high-speed jet aircraft, rival battleships and deep-sea submarines.

DETECTION

To engage any of these targets first they need to be detected – something achieved via orbiting GPS satellites, radar and sonar communication systems.

DEFENSIVE

If attacked, a battleship can deploy decoy systems like flares and countering anti-missile munitions or directly engage incoming threats with smart autocannons.

OFFENSIVE

When on the offensive, a battleship can engage these targets with guided or unguided missiles, explosive shells and deadly torpedoes.



BATTLESHIP TYPES



01 CORVETTE

One of the smallest types, the corvette is a lightly armed and manoeuvrable vessel used for coastal operations. Stealth corvettes are now becoming popular too.



02 FRIGATE

Lightly armed, medium-sized ships generally used to protect other military or civilian vessels. Recently, frigates have been re-focused to take out submarines.



03 DESTROYER

Large and heavily armed, destroyers are typically outfitted for anti-submarine, anti-aircraft and anti-surface warfare and can remain at sea for months on end.



04 CRUISER

The cruiser is an armed-to-the-teeth multi-role vessel akin to a modern destroyer. While cruisers are still in use, they have largely been superseded now.



05 CARRIER

The carrier is an armed-to-the-teeth multi-role vessel akin to a modern-day destroyer. While carriers are still in use, they have largely been superseded now.

“THE CRUISER IS AN ARMED-TO-THE-TEETH MULTI-ROLE VESSEL AKIN TO A MODERN-DAY DESTROYER”

WEAPONS IN FOCUS

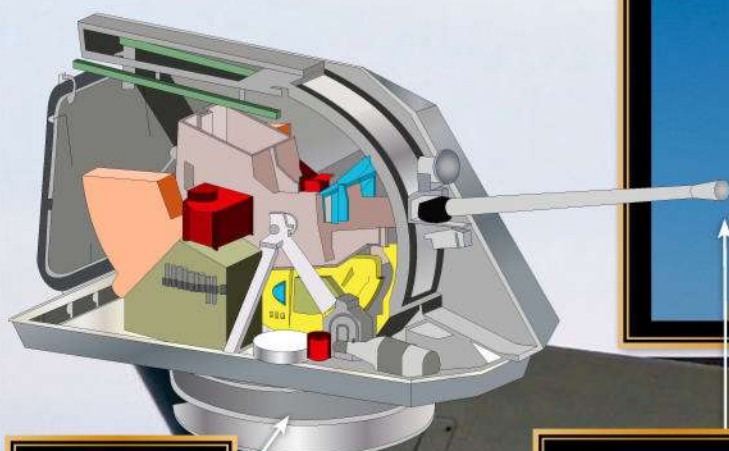
WE TRAIN OUR SIGHTS ON FOUR OF THE MOST ADVANCED ARMAMENTS ABOARD THE LATEST BATTLESHIPS

MK 110 NAVAL GUN

Capable of delivering automatic salvos of 220 57-millimetre Mk 295 Mod 0 ammunition (fragmenting high-explosive shells) each and every minute, the Mk 110 naval gun is quite simply a shell-slinging colossus. Stemming from one of the most long-lasting naval gun series of the last 100 years, the Mk 110 comes with a selection of hot features. These include the ability to fire both standard and smart munitions, a gun barrel-mounted radar for refined measuring of muzzle velocity, an instantaneous ability to switch between ammunition types and a stealth-oriented ballistic shield that protects the gun while allowing a full 360-degree traverse, plus a fully digital fire-control system that enables the Mk 110 to respond to exact pointing orders and ammunition fuse selection milliseconds prior to firing. Indeed, the only thing that stops the Mk 110 from bombarding its target continuously is its shell capacity, which rests at 120 rounds with a three-minute reload process.

ADVANCED GUN SYSTEM

The Advanced Gun System (AGS) is a new naval gun from BAE Systems capable of firing precision munitions at super-fast speeds and at over-the-horizon ranges. What makes it special is that far from firing traditional unguided shells – as most naval guns have been designed for – it fires the Long Range Land Attack Projectile (LRLAP), a 155-millimetre precision guided artillery shell that, thanks to base bleed rocket assistance and an extended range fin glide trajectory, can travel over 105 kilometres to a target. What's more, it then has a circular error probable (i.e. accuracy) of only 50 metres, making it incredibly precise even at great distance. Throw in the fact that the AGS can fire ten of these LRLAPs per minute from its stealth-designed turret and that it can fire traditional unguided munitions and it becomes clear why it's being incorporated into many warships.



TURRET

The MK 110's turret is capable of a full-circle sweep and contains the gun's firing systems. The turret allows the gun to elevate from -10° through to $+77^{\circ}$ and is protected with a ballistic shield to disguise it from radars.

BARREL

The MK 110 has a single firing barrel with a progressive, 24-groove parabolic twist. The barrel's bore length is 3,990mm, with the gun capable of firing 57mm conventional and smart munitions.

HOIST

The MK 110's 57mm Mk 295 Mod 0 ammunition is delivered to the turret emplacement via a mechanical loading hoist. Ammunition is stacked 120 rounds deep and automatically fed into the firing chamber.

VERTICAL LAUNCH SYSTEM

The Vertical Launch System (VLS) is a state-of-the-art multi-missile launching system. Unlike previous systems, which could only fire one specific type of missile, the VLS is modular, so a variety of projectiles can be fired from the same enclosures. The missiles, which on the Zumwalt-class destroyers include the RIM-162 Evolved Seasparrow missile, Anti-Submarine Rocket (ASROC) and Tactical Tomahawk subsonic cruise missile, are enclosed in a series of launch cells within the ship's hull and, when launched, are fired out of the top of the deck. By concealing the missiles within the ship until needed, the VLS improves the ship's overall radar cross-section, making it much harder to detect. Each missile fired from a VLS cell is of the guided variety, with a selection of high-explosive warheads directed to the target by radar or GPS.



RADAR

A bulbous, tubular radome encases the Phalanx's Ku-band search and gun-laying radar. The search antenna sweeps for threats, and once a target is confirmed as hostile, the gun-laying antenna locks on.

PHALANX CIWS

Every battleship built today comes with a close-in weapon system, or CIWS, and out of these systems the Phalanx CIWS is the leader of the pack. It is a point-defence weapon designed to attack any target – be that enemy fighter jets or missiles – which has managed to evade the battleship's longer-range offensive weapons with its massive 20mm M61 Vulcan Gatling gun. What makes it really special though is its advanced targeting system, which consists of two independent antennas that work together to engage a target. The first antenna is used for searching for the incoming target and delivers bearing, velocity, range and altitude information. The second antenna is then used to track the target on its approach until it is in firing range. As soon as an incoming target is close enough, the Phalanx can then automatically fire, using a selection of sensors to guide spent rounds at the unfortunate target in a split second.

GUN

Damage is dealt with a 20mm M61 Vulcan autocannon. The cannon has a muzzle velocity of over 1,100m/s and an effective range of up to 3.6km.

DRUM

Ammunition for the Gatling cannon comes courtesy of a large magazine drum. This dispenser can feed the cannon at a rate of over 4,000 rounds per minute.

TENSIONS IN THE SOUTH CHINA SEA

DECADES OF POLITICAL JOSTLING COULD SOON SPILL OVER INTO OPEN HOSTILITY AS CHINA TRIES TO EXTEND ITS TERRITORY

WORDS KATHARINE MARSH

In 1947, the world was in pieces. Just two years after the end of World War II, Europe was shattered. It didn't seem like Asia was faring any better either. It was then that China's ruling party, the Kuomintang, drew up a new map of their territory: they had the mainland, and some islands off the south and east coasts. But there were also 11 dashes, stretching into the South China Sea around the Paracel and Spratly islands. While the 11 dashes may have gone down to nine, one thing didn't change – China claimed sovereignty over the majority of the South China Sea, and it wasn't about to let up.

The first problem came when the Chinese Government was overthrown by Mao Zedong. The Kuomintang fled to Taiwan to set up an independent state – although China thought differently – and took their claims with them. Soon enough, China, Taiwan, Vietnam, the Philippines, Malaysia and Brunei all said they owned parts of or whole island chains, and none would yield.

According to China, the largely uninhabited islands had been Chinese for centuries. Vietnam rebutted that it had actually owned the islands since the 17th century and had the documentation to prove it. The Philippines,

meanwhile, claimed sovereignty because the islands were closer to them geographically. Malaysia and Brunei both said they controlled the parts of the sea that fell under their economic exclusion zone.

But why were they all fighting over one seemingly innocuous sea? The main reason was resources; nearby islands yielded large amounts of natural resources. While the area was unsurveyed, it was enough for countries to want to stake their claim. And with the islands came the waters, which fishermen from all countries used to make a living. It didn't help that the South China Sea was, and still is, used for large amounts of international trade. In fact, \$3.37 trillion of trade passed through in 2016 alone.

In 1974, things turned ugly. The Chinese launched an invasion (although not in their eyes) of the Paracel Islands, killing more than 70 Vietnamese troops. The two countries would fight again in the Spratlys in 1988, with Vietnam losing 64 sailors this time. It was clear that China wasn't going to back down, and with an ever-increasing population, the country certainly had the manpower to assert its dominance.

Part of this dominance has come in the form of artificial islands. Since 2013, China has created more than 3,000 acres of land in the South China Sea. Devastating coral reefs and creating lasting environmental damage, the islands are for military use, although the Chinese Government vehemently denies any wrongdoing. The presence of the Chinese military on the islands has caused much contention considering most of the rest of the world refutes their territorial claims.

Militaries getting out of hand has never been something that the US has taken lightly. In the early days, the US refused to take sides, but after an international tribunal deemed China's acts illegal, the American position has shifted. While China openly criticised the ruling and even refused to turn up to court, citing bias and corruption, the US began sending warships to the region in what they termed 'freedom of





A map detailing different countries' claims in the South China Sea, though China and Taiwan are joined together as one

navigation' missions. These missions haven't ended. China has accused the US of provocation and interfering in regional matters, but US Navy and Air Force ships and planes still patrol the region. What hasn't helped is China's attitude towards Taiwan, a fellow claimant on part of the South China Sea. Despite the Kuomintang Government fleeing China in 1949 to set up its own dictatorship in Taiwan, China still sees the two as one country. Taiwan – and a lot of

the international community – disagrees. With its own currency, elected president, passports and more, Taiwan has all the hallmarks of an independent nation.

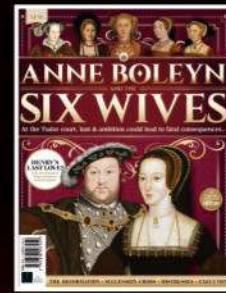
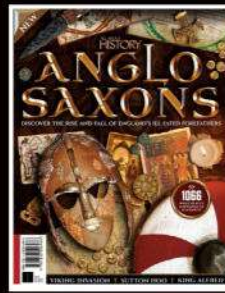
As a result of differing opinions, peace has barely been maintained. While Taiwan vehemently opposes any suggestion of Chinese interference, China sees it as its right to interfere, and it has made it clear that it is willing to go to war. As recently as December

2021, Chinese nuclear submarines were spotted in the strait between the two.

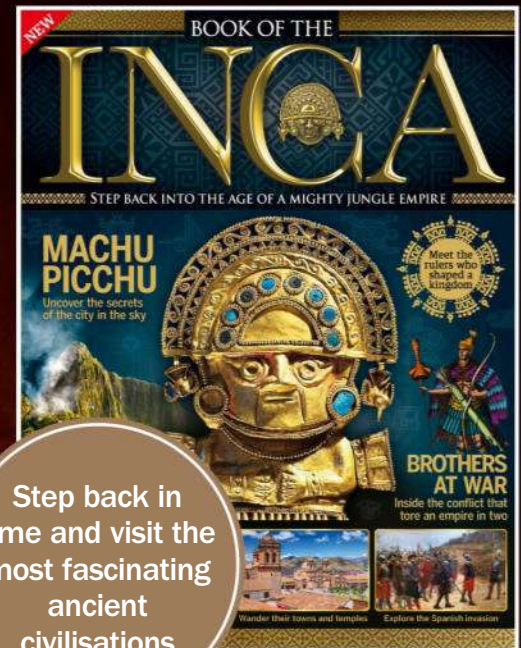
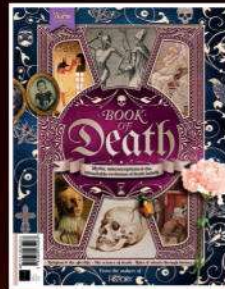
With war looking ever more likely, claims in the South China Sea come crashing back into the picture. Military bases on the artificial islands mean China can be ready to launch an assault at any moment. America's presence, after it has declared support for Taiwan in the event of war, could be seen by China as reason to attack, and who knows which countries in the area will be caught in the crossfire. In such a small area, heightened tensions are getting closer to a boiling point. It could be months or years, but many say with some certainty that the next great naval clashes will unfold in the South China Sea.

“SINCE 2013, CHINA HAS CREATED MORE THAN 3,000 ACRES OF LAND IN THE SOUTH CHINA SEA”

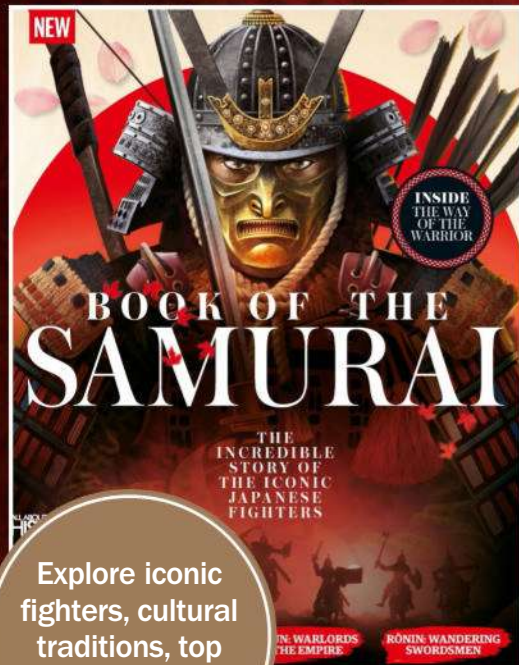
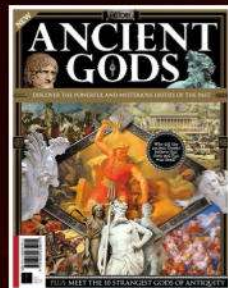




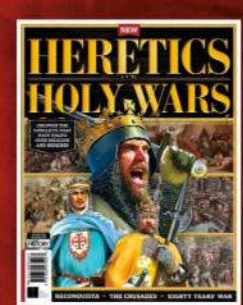
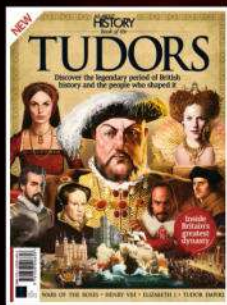
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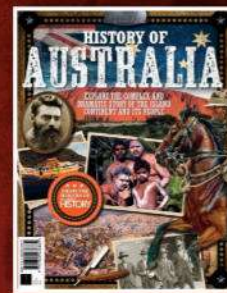
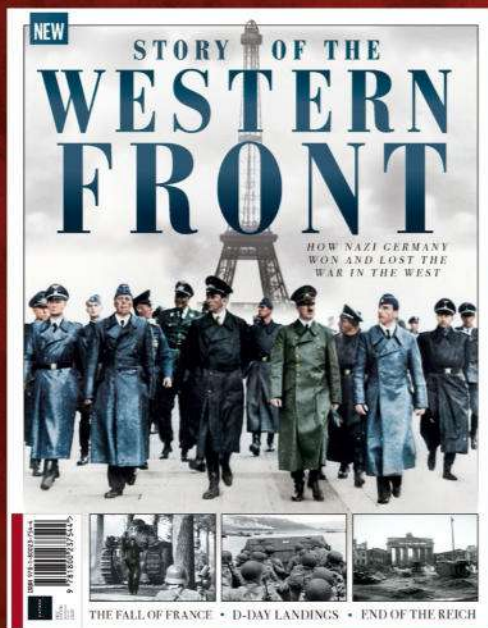
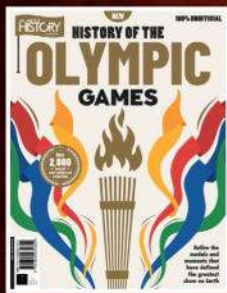
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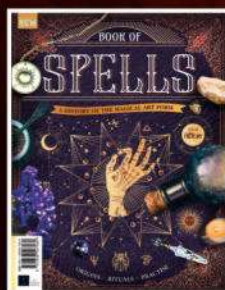
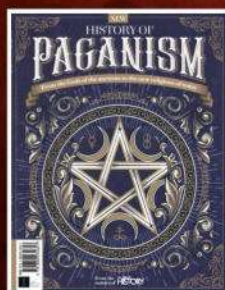
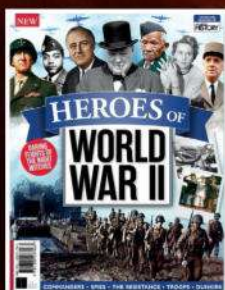
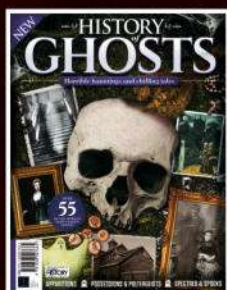


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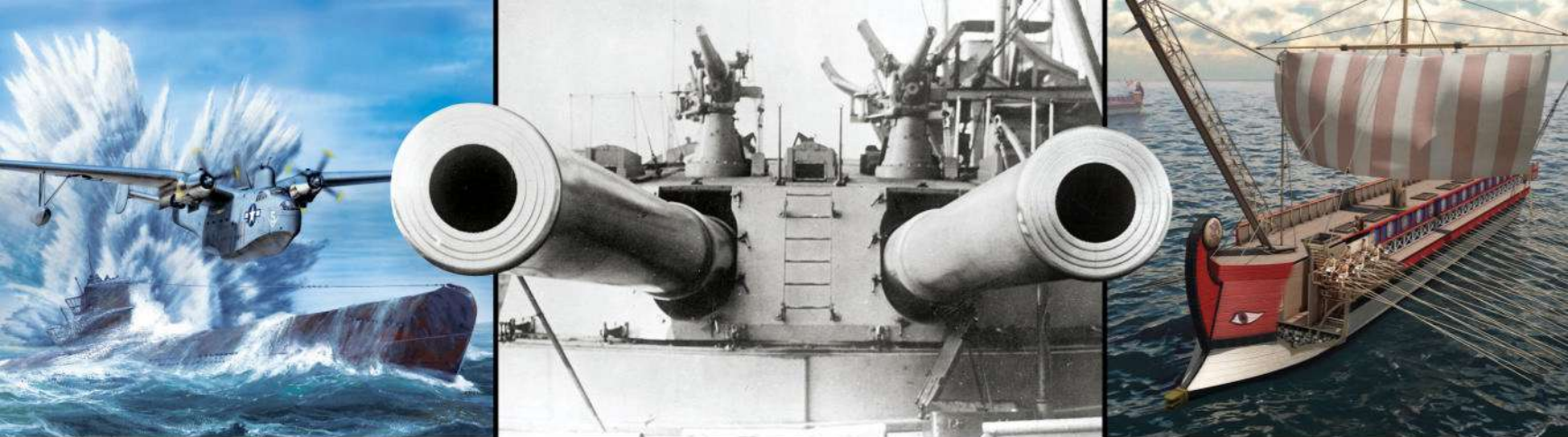
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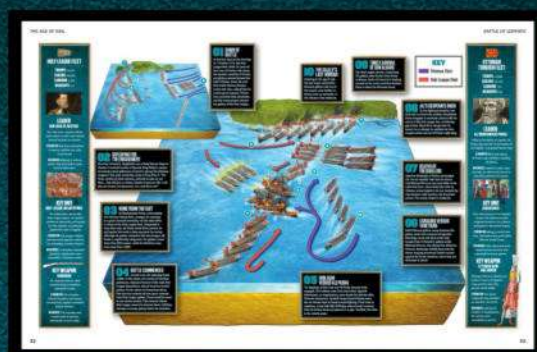
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